THE

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ECONOMIC PROBLEMS SUGGESTED BY THE WAR.

IT is sometimes said by certain wiseacres that just as the war began suddenly so it will come to a sudden end. On the other hand, there are those who say that it will endure, so far, at any rate, as England is concerned, for a considerable period of time.

Whatever the period of its duration, it behoves those who are interested in trade and manufacture to watch its effect upon the great industries of the country, and to provide, as far as possible, for the future.

It is always best to take the cheerful view of things; to assume that the war will come to an end within a reasonable time; and that the Empire will arise triumphant, invigorated and strengthened by trials which have been nobly borne.

What will then be the state of affairs? The old order will have changed—giving place to the new. What will the "new" be like? It is idle to refer to the pages of history; for history records nothing like the present Armageddon. It stands apart from every other great war in every possible respect; but the fundamental difference, from the economic point of view, is that we shall here have an opportunity of studying the effect of war upon a gigantic scale upon modern industries.

We do not forget that in the early days of last century, Europe was convulsed from end to end by the Napoleonic campaigns; true, this country played very much the same financial part in those struggles that she is now playing in this; but those were days when industry, as we now know it, was in its earliest infancy. Even the steam engine was not much more than a toy!

The march of industrial progress in which England has taken so prominent a part will have been arrested during the present war. Much of the hard cash in the possession of this country at the outbreak of hostilities will have passed over to the United States, while there can be no question that incomes, whether earned or not, will be taxed very heavily for years to come. Income-tax, once raised, has a strange tendency to stay "up."

In his "Progress of the Nation," at page 687, Mr. Hirst tells us: "Mr. Gladstone's Budget of 1853, with its famous defence and criticism of the income-tax, was accompanied by a plan for the gradual reduction of that tax, and for its final extinction in 1860. . . . But these fair financial prospects were destroyed by the Crimean war, to meet the cost of which out of taxation as far as possible, Mr. Gladstone promptly doubled the income-tax, raising it from 7d. to 1s. 2d. in the £."

All this about a "little" war, in which we lost 28,000 brave men, and which added but £30,000,000 to the National Debt! It is important, however, to note that increase of debt imperfectly represents the financial sacrifice of the Crimean war, because, whereas before the war expenditure

had not for 30 years and upwards reached £56,000,000, since the war it has never fallen below £64,000,000.

Having said this much on the larger economic results of the war, let us dwell upon one or two points which concern the industrial world.

Leaving out of account the possibility of invasion, a form of "frightfulness" to which the enemy may have recourse in the last resort, and ignoring the Zeppelin as a means of doing important damage, it is not likely that much material damage will be done to industrial property or machinery during the war. The factory may be turned over, for a time, to the manufacture of munitions of war; but the lathes and other machinery will remain, to revert, when the clash of arms has subsided, to their former uses.

It is the question of *personnel* which, at first blush, seems likely to give rise to the greatest difficulty at the conclusion of hostilities. No doubt many of those who are now fighting in the trenches will return to the workshop; but many valuable lives will be lost before peace can even be thought of. Again, those who do return will have lost something of their former efficiency. The military life creates a certain restlessness and disinclination for work indoors. Those who went away as youths in the prime of their manual dexterity will return as men who will take time to recover all their former skill.

It may be taken, therefore, that in the trades and industries which have given of their best skilled workers to the army, there must be a certain falling-off of efficiency as compared with the state of things before the war. But there is an important aspect of the matter which should not be lost sight of. Employment in the munition shops has been found for a whole army of workers. Whatever its troubles with Trade Unionists, the Government has apparently had but little difficulty in getting new workers (probably because the pay is good), and in this respect it differs from some of its predecessors.

What is to become of the munition workers after the war? This is one of the most interesting of speculations. By a relaxation of rules, the Trade Unions have allowed the unskilled to do skilled work. The skilled workman (so-called) is no longer in a close box. Much work heretofore classed as "skilled" is only so because the Trade Union rules make it so. After the war, the work of making munitions will come to an end; but the man who can make a fuse for a 4·7 shell is by no means an unskilled workman.

There are certain other factors which must be considered when discussing the probable condition of the Labour market after the war. While it is probable that for a time at any rate an army of officials will have to clear up matters connected with the war, the Civil Service will be, and will remain, considerably reduced. Indeed, the Retrenchment Committee has already taken the matter in hand. Vacancies, as they occur, are not being filled; and many an official whose office hours before the war were "10—4 and two hours for lunch" is compelled to do a real day's work. The time of soft jobs is over. In the result competition will be keener, and the man who is content to do honest labour for a reasonable wage will come into his own.

We must look for the inevitable reaction which will follow after the demand for munitions of war has been satisfied. Contracts with the Government will come to an end. The day of high prices for shells and fuses, the manufacture of which is unproductive in the larger sense, will pass away, and owing to the disorganisation of trade both at home and abroad, fresh orders will not be easy to obtain.

But there is another side to the picture. Our manufacturers have often had to complain, in the past, of German competition. By the process of peaceful penetration, the products of German manufactories were being sold in all parts of the world and, owing to subsidies from the German Government, were often sold at prices with which our commerce could not compete. After the war these conditions will have changed, there is reason to hope, for the better.

Our commercial lines of communication with foreign countries, although menaced, have not been completely severed. We have the entry to countless markets where no German goods have been seen since the beginning of the war—and, as far as our present export trade ability allows, we shall have accustomed the buyers to English goods. Further, it is to be remembered that by the time the war is over some people will have found it possible to do without German goods, while others will have learnt to manufacture the same articles for themselves.

Lead.

Lead has remained in a continually strengthening position, the arrivals coming forward from abroad being insufficient to meet the demands which, particularly in connection with Russia, have been upon a very large scale indeed. The contribution to the world's supply which has come from Spain shows this year a considerable diminution against the corresponding period of 1914, the Spanish exports for the seven months to July 31st indicating a falling-off of over 16,000 tons. The quantity shipped from Spain to the United Kingdom, however, for the nine months ended September 30th showed an increase of about 13,500 tons, while our total imports for the nine months were 33,000 tons to the good at 198,000 tons, compared with 165,000 tons. The larger portion of the increase arose from the greater contributions made by the United States, there being over 43,000 tons received from there, against 19,000 tons a year ago. The general merchant business in lead has been comparatively moderate, but the consumption in this country on account of munitions is enormous, and is likely to remain so for an indefinite period, while the position has become gravely complicated by the difficulties now being experienced in obtaining freight room for shipments from America to England. A large portion of the Russian business is being done direct from New York, while the closing of the Panama Canal, owing to landslides, is necessitating shipments being made overland to Seattle, and thence *viâ* steamer to Vladivostock. Italy is, of course, purchasing heavy quantities of lead, but most of the business in this connection is being done direct with Spain. The tightness of near deliveries has for some weeks past been a feature. This may be relaxed as pressing requirements are satisfied, but there is at least a chance of renewed stringency in the near position towards the beginning of next month. There seems every appearance of plentiful supplies existing in North America, but the shipping difficulties, to which allusion has already been made, constitute a formidable drawback to the transference of lead from producing districts in America to consuming areas in Europe.

The Italian Electrical Industry.

About two or three weeks ago we referred to the question of the promotion of British export trade with Italy, and set forth some of the difficulties which will have to be overcome in order to develop business relations with that country. It will now be of interest to hear the Italian side of the problem, which has been specially brought into prominence through the war. The case is put forward by Signor Fumero in a recent issue of *L'Elettricita*, and by way of preamble it may be stated that, although no countries are specifically mentioned, the author has directly in mind Germany and Austria-Hungary, if not Switzerland also. He remarks that until now foreign industry in the Italian market, especially with regard to deliveries to the State, has been in an enviable position as

compared with the national industry. In fact, the former has furnished plant in different countries at remunerative prices, whereas foreign competition is not tolerated in principle in the matter of Government supplies in the countries which have exploited the Italian market, and which are effectively protected by high import duties. As a consequence the foreign firms have considered it proper to supply Italy as a means of realising indirect advantages, and at the same time increasing their production and decreasing their own general expenses, whilst direct benefits have been provided by the indirect bounties which those countries enjoy. The latter part of the statement apparently refers to the private bounties granted in Germany on the consumption of coal and iron and steel used in the manufacture of export commodities. This proves, in the opinion of Signor Fumero, that the 5 per cent. preference granted in Italy in favour of the national industry represents nothing of practical value. The prices to which it is necessary to descend in order to overcome foreign competition in electrical machinery are so low as to cause the Italians to make real sacrifices, notwithstanding this apparent protection of 5 per cent. It is therefore contended that the State should emulate foreign countries by the adoption of the principle that what is needed by the public Administrations and the railways (and tramways), based upon public concessions, and which can be made in the country, must be acquired in the country. Why, it is asked, should the Italians leave their door open, when foreign countries close their markets in the face of Italian industry?

It appears that a Government Commission is engaged upon the question of revising the Customs tariff. In this connection the author suggests, for the consideration of the Commission, the advisability of studying whether it would not be equitable to re-arrange the new duties on electrical machinery and parts thereof. For instance, it is hinted that the duties on these should not be less than £1 8s. per cwt. on machines weighing less than one ton, and £1 per cwt. on machines and transformers of a weight exceeding one ton. Apart from this measure of protection against imports, Signor Fumero considers that a further means of excluding foreign competition should be adopted by the stipulation, in connection with all deliveries of electrical machinery required by State Administrations, that Italian firms exclusively should be called upon for tenders, and that they should be placed under the obligation to construct the plant in Italy in the same way as is practised abroad; and a similar observation is made in regard to contracts for public or local authorities and holders of concessions, in so far as the producing capacity of the country is concerned. In order to safeguard the legitimate interests of concessionaires —obviously private owners of tramways and electricity works—it is suggested that the Government should reserve the eventual power of settling the maximum prices beyond which the right of national exclusiveness should cease. This proposal, although not definitely expressed, would probably also apply to public or State contracts. It is further held that in contract conditions the State should not be able to delay the acceptance of delivery or of payments, and that the latter should be made in instalments so that the manufacturers should not become the bankers of the State, the inference being that payments are now unduly prolonged and capital is locked up and development of the industry prevented.

The author also discusses other problems which are declared to hamper the progress of national industry. Among these are mentioned the burden of taxes and other charges which affect more directly the production and consumption of electrical energy, and which, it is contended, should be reduced with the object of promoting installation work and the use of electricity. More important still from the manufacturing point of view is the question of transport. Signor Fumero argues that the rates on the State railways ought to be lowered, as well as those charged by the subsidised shipping companies, and that the reduced charges should also be applicable both to manufactures for exportation and to the raw materials needed by the electrical industry. The author is of opinion that all these matters should be taken in hand now while the nation is at war, so that when the world contest is over and the commercial struggle is resumed, Italian manufacturers would possess a flourishing, vigorous and vital industry. The Italian motto, therefore, is, according to Signor Fumero, Italian work for Italian industry. The same guiding principle has recently been adopted in France, Spain and Russia; it has long existed in Germany and Austria-Hungary, although very little information is now obtainable concerning the Dual Monarchy. But even if we accept the principle as it stands there are doubtless many classes of manufactures in which one nation may complement the requirements of another, and it is for us to ascertain in what particular directions we can develop reciprocal trade with Italy. Except in these respects part of the policy advocated by the Italian author is of such a profoundly Protectionist sentiment that there would be no scope left for the development of electrical trade with Italy if this policy were endorsed by the Customs Commission and the Government. At the same time the real object in view, apart from the promotion of national industry, may be said to be the complete emancipation of the country from Germanism, and in this effort the Italians do not by any means stand alone at the present time, and will not do so when the time arrives for the conclusion of new treaties of commerce.

Fuel Economy.

The importance of economising in every possible way has been forcibly brought home to us of late by the utterances of Cabinet Ministers, the imposition of fresh taxes, and the rise in cost of all kinds of commodities, and will be still more emphatically impressed upon our perceptions in coming years, as our burdens grow heavier. Not only does this necessity affect the individual in his private concerns—by restricting his spending power, it reacts upon all distributing undertakings, and, moreover, it bears directly upon the latter and upon all public bodies in view of higher taxation, wages, and interest on borrowed capital. The nation, as a whole, must cut down expenditure to the utmost, and one of the most important directions in which economy can be practised is in the consumption of fuel, which constitutes our most valuable natural store of wealth. We therefore offer a hearty welcome to the appointment of a Committee by the British Association for the promotion of this object, which is announced in our "Notes" columns to-day. The function of the Committee is to consider the whole question of fuel economy and the better utilisation of coal from a broad and national standpoint, in order to urge upon the Government and the community generally at this juncture the need of systematic scientific control of fuel consumption on public lines, as a direction in which large national economies can be most healthfully and advantageously realised in the immediate future. That there is abundant scope for the activities of such a Committee is a notorious and regrettable fact. Great progress has undoubtedly been made during the past 20 years, and the influence exerted in this direction by the electricity and gas undertakings of this country unites these rivals in an honourable alliance; both have done splendid work in reducing the production of smoke—so markedly demonstrated in our great cities by the diminution in the prevalence of fogs—and in improving the methods of utilisation of coal, but there still remains a vast field for invention and enterprise. We cannot withhold a tribute of appreciation to the gas undertakings, which, unquestionably, use coal to far greater advantage than electricity works; there is no doubt that the gasification of coal and the recovery of by-products is the only method of its utilisation that can be regarded as scientific and economical, and we look forward to the time when, by the co-operation of the gas and electrical industries, this system will be made standard practice. But pending the realisation of that ideal, there is plenty to be done, and we congratulate the B.A. on once more taking the lead.

DECIMAL COINAGE AND THE METRIC SYSTEM.

(*Continued from page* 486.)

Taking now the questions in order, the first is: "Do you employ the metric system in your correspondence with foreign clients?" This is very generally answered in the affirmative. Messrs. G. P. Wall, of Sheffield, say they employ it "exclusively" in all correspondence. Messrs. Eckstein, Heap & Co., Ltd., of Manchester, will "be pleased to employ the metric system in correspondence with foreign clients if this can be made at all general"—but it seems to us that there is no need to wait for others in this regard. Many say, "When required." Some firms that express themselves strongly in favour of the metric system nevertheless do not employ it in their correspondence. The Bastian Electric Heating Syndicate, Ltd., of London, and Messrs. W. R. Sykes Interlocking Signal Co., Ltd., London, both reply, "Yes, invariably." Messrs. A. P. Lundberg & Sons say "Not usually, but will make a practice of doing so in future correspondence with foreign clients." Messrs. Ward & Goldstone, of Manchester, say that they "adopt with equal facility the metric system or the present standard English system." and in connection with their foreign trade they invariably quote and supply on metric measurements to meet the convenience of their clients. Messrs. C. A. Vandervell & Co., London, make it a rule to correspond with their foreign clients in their own language, measurements, and coinage; "naturally the latter are usually in the metric and decimal systems." Messrs. Erith's Engineering Co., Ltd., London, have done so since 1893. We need not give further quotations in this connection, as the majority is so heavy, and most firms simply answer "Yes."

We may point out that in most cases the advantages of the metric system can be very largely availed of in correspondence, tenders, etc., even where the system is not used in the shops. All that is necessary is a set of conversion tables, and a correspondence clerk with sufficient intelligence to use them properly. Now that lady clerks are coming more extensively into vogue, all difficulties on this score should soon be overcome! As we shall show later, it is a mistake to suppose that the metric equivalents for English measures involve a string of decimals; never more than two decimal places are necessary, and then only if an accurate fit is required; the dimensions to bolt-holes for foundations, overall sizes of a motor, etc., need only be stated to the nearest millimetre, and weights will hardly ever be required to a gramme.

The second question related to the use of (*a*) metric weights and measures, and (*b*) foreign coinage, in catalogues and price lists for foreign circulation. As regards the former, the same considerations apply as in the case of Question 1—the metric equivalents can be inserted with ease, and the additional space occupied is well expended; but there is no need for any additional space to be occupied, unless the lists are intended also to serve the needs of the Dominions and the United States—the English measures may be omitted altogether. Surely the very first consideration in dealing with foreigners, in the face of fierce competition, should be to make it as easy as possible for the potential buyer to understand what we offer him, and therefore to put our offers in his language, of which the metric system is an essential part. As regards the second part of the question, we have already referred to the difficulty due to variable rates of exchange, a difficulty which is aggravated at present, and is likely to persist for some time after the conclusion of hostilities. Another obstacle is the fact that whilst the metric system is the same everywhere, each country has its own system of coinage, and although the coins in many cases have the same value, or very nearly so, they are known by different names—or worse, the same name is applied to coins of different denominations, as in the case of the dollar, krone, etc. To meet this difficulty, pending the adoption of a decimal system in this country, we suggest that price lists for circulation on the Continent (and in many other countries) might, with advantage, be priced not only in English units but also in terms of francs, the equivalent values of which are known all over the world. The exchange difficulty is not insuperable; it can be met by a proviso, with tables showing how the prices would be varied in the event of a change in the rate. It is very significant that a considerable proportion of our correspondents use foreign coinage in their lists. For instance, Messrs. G. P. Wall use metric weights and measures, and give prices "exclusively" in terms of foreign coinage. So do the Associated Battery Co., Ltd., of Penge, S.E. Messrs. Eckstein, Heap & Co., however, "think it would be a mistake to make out tenders for abroad in foreign coinage" on account of the variation in exchange. Messrs. Donovan & Co., of Birmingham, "find it exceedingly difficult to quote in foreign coinage at present owing to uncertainty of rate of exchange." Messrs. Fredk. Braby & Co., Ltd., London, have the same difficulty. The General Electric Co., Ltd., have catalogues in foreign coinage, and use the metric system in correspondence and catalogues. The Wardle Engineering Co., Ltd., also answer questions 1 and 2 in the affirmative. Several of our correspondents point out that much of their foreign business is done by their agents, who have special catalogues prepared for local distribution; of these, Messrs. C. A. Vandervell & Co. and Messrs. Ozonair, Ltd., name eight languages in which their catalogues are printed. Messrs. John Tullis & Son, Ltd., Glasgow, intend to use metric weights and measures, and francs, in a forthcoming French catalogue.

The British Insulated & Helsby Cables, Ltd., use the metric system in some of their catalogues, but do not give prices in terms of foreign coinage; on this question they write:—

> We appreciate the advantage of describing our manufactures in terms of metric weights and measures as far as our foreign clients are concerned, but we certainly are very doubtful of the advisability of pricing our manufactures in terms of foreign coinage. There is, perhaps, no great objection to this in normal times in dealing with countries where exchange is fairly stable, and, in point of fact, we not infrequently do this when requested, but in dealing with many countries it would be an extremely risky proceeding, and would, we consider, introduce too much of the speculative element into our transactions.

The "Z" Electric Lamp Manufacturing Co., Ltd., say:—

> We are now actively engaged in completing our arrangements for increasing our foreign trade, and recognise that the first thing necessary to enable us to do this is to have all catalogues printed so as to be intelligible to the *natives* of the country for whom they are intended.

The Bastian Electric Heating Syndicate, Ltd., use the metric system and foreign coinage in a French list, and are having others prepared in other languages. Messrs. Griffiths Bros. & Co., London, and Messrs. J. H. Tucker & Co., of Birmingham, follow the same practice, and so do the Pulsometer Engineering Co., Ltd., Reading, except as regards coinage. Messrs. W. F. Stanley & Co., Ltd., London, and The Park Royal Engineering Works, Ltd., London, are inserting metric equivalents in their new catalogues now in preparation. The London Label Co., Ltd., "always quote in the language and coinage and measurements of any foreign country." Messrs. D. H. Bonnella & Son, Ltd., say they

> propose to make use of the metric system with any further catalogues issued, although we have not done so in our previous issues; but in view of the numerous inquiries received from abroad it is necessary that we should do so.

Mr. Robt. W. Paul, London, Messrs. Mawdsley's, Ltd., Dursley, and Messrs. Ward & Goldstone have

made similar arrangements in preparation for the return of normal conditions.

The foregoing quotations are fairly representative of the whole; some important firms, whilst issuing catalogues in foreign languages and not only using the metric system, but also stating prices in terms of the local coinage, prefer to remain anonymous. Our general impression is that there is a strong tendency towards the more general introduction of metric weights and measures into catalogues, but that the difficulties met with in connection with the rates of exchange, and the absence of a universal system of coinage, greatly hinder the adoption of the local coinage.

Question No. 3 was intended to ascertain to what extent the metric system is already in use in our workshops, and the replies make it clear that in very many cases it is employed for some classes of work. Comments on this question are few. Messrs. Premier Electric Heaters, Ltd., Birmingham, and Messrs. Connolly Bros., Ltd., Manchester, say: "Yes, as far as possible." The Westminster Engineering Co., Ltd., London, say "No," but add, "We sometimes get drawings from customers with dimensions in metric system, and find no difficulty in the shops with these." Messrs. Ward & Goldstone, Manchester, say they "adopt with equal facility the metric system, or the present standard English system," and "find the use of metric weights and measures in our wire and cable works of immense convenience." Messrs. Best & Lloyd, Ltd., Birmingham, reply, "Yes, but not exclusively." Messrs. Isenthal & Co., Neasden, also reply "as far as possible," though certain standards in English measures have to be conformed to for convenience; their letter will be reproduced later. Messrs. Willans & Robinson, Ltd., Rugby, replying in the affirmative, say, "We believe that we may claim to be one of the first, if not the first, mechanical engineering manufacturers in this country to have adopted the metric system"—a claim which, to the best of our knowledge, is justified. Messrs. Wilson Hartnell & Co., Ltd., Leeds, say: "Yes, for all electrical work, measurements and calculations, for all work for Willans & Robinson and a few others; for Vickers, inches decimally divided." Messrs. G. P. Wall, Sheffield, say, "Quite as much as the English system." A firm of instrument makers say they "use either the English or metric system, according to which is more convenient for the particular work," but prefer to remain unnamed. Mr. C. C. Mason, joint managing director of the Cambridge Scientific Instrument Co., Ltd., in an interesting letter which we will reproduce later, states that his company uses the millimetre as a unit of length for practically the whole of its manufactures, but both systems of units are used on the same drawings, according to convenience; English and metric weights are also used equally in the workshops.

This question is so closely related to question No. 4 (*b*) that we cannot say much about it without risk of a great deal of repetition when discussing the latter; it is difficult also to separate questions 4 (*a*) and 4 (*b*), as so many of our correspondents deal with them in combination. They are really connected only by one common factor—the use of the decimal system alone instead of the quaint mixture of binary, ternary, and other systems met with in our English standards—but that is a factor of fundamental importance, the basis of the world's system of numeration. We regard the replies to question 4 as by far the most important; the other questions relate only to what manufacturers have done under the existing conditions, as a matter of policy or convenience, whereas this question elicits their views as to whether those conditions should be perpetuated or drastically amended. As we have pointed out, four-fifths of our correspondents favour the latter course, many of them very emphatically. The London Shafting & Pulley Co., answering "yes" to both questions (4 (*a*) and 4 (*b*)), add: "All our patterns and gauges are to English measurements; we should be pleased to alter them if the metric system were generally adopted." We congratulate this firm on its unhesitating and whole-hearted adhesion to the system, whilst we suggest that, with a few exceptions, alterations to patterns and gauges would not be required. The Associated Battery Co., Ltd., of London, reply, "Yes, certainly," to both questions, and remark that "English people are so conservative that it does not appear probable that any alteration will be made unless it is made compulsory." The Wardle Engineering Co., Ltd., Manchester, tersely vote "Yes, most emphatically!" Messrs. Duncan Stewart & Co., Ltd., Glasgow, who issue some of their catalogues in Spanish and Dutch, agree with us "that it would be of great assistance in conducting foreign business if the metric system was in general use in this country." Messrs. Venner Time Switches, Ltd., London, write "Emphatically, yes!" Messrs. H. T. Boothroyd, Ltd., Bootle, would "like to see the metric system universal," but unless it were universal they could not see their way to adopt it. The British Mica Co., Ltd., London, say, "Most emphatically," and add that "foreigners are not likely to understand our ridiculous antediluvian tables." The British Thomson-Houston Co., Ltd., Rugby, answer "Yes, because they are scientifically correct, though the changes would be difficult and expensive to put into effect." Messrs. Connolly Bros., Ltd., Manchester, say: "From a practical personal experience obtained in England, on the Continent, and in the United States, we are of opinion that an immense saving in otherwise unnecessary calculations would be ensured. We know of no drawbacks in our business." This is particularly interesting, because a well-known firm of cable makers holds the opposite view, as will be seen later. The British Insulated & Helsby Cables, Ltd., point out that the question

is largely one of individual opinion, and the subject has not been discussed nor any pronouncement made as to the views of the company as such. We think, however, that we can safely say that from the engineering point of view the adoption of metric weights and measures would be of great advantage to all concerned.

Messrs. Ferranti, Ltd., Hollinwood, say: "We consider that the matter is one of great importance, and should be pushed with all the power at your command." Messrs. W. E. Burnand & Co., Sheffield, say:

We think the general adoption of a straight decimal system would save much time which could be more usefully employed than in learning our conglomeration of largely unrelated weights and measures, would reduce errors (more time-saving), and induce a better general sense of proportion, with an immense cumulative benefit that it is worth a lot of trouble to bring about.

Messrs. D. H. Bonnella & Son, Ltd., make goods to special requirements,

and consider that if there could be uniformity in the measurements used, it would be a considerable advantage, as some customers employ the ordinary system, some mm., and others decimals. We certainly think that your efforts in advocating the adoption of the metric system should receive the support of all manufacturers.

Messrs. Etchells, Congdon & Muir, Ltd., Manchester, write:

We are in receipt of yours of the 15th inst. on the subject of decimal coinage and the metric system. We are entirely in accord with the movement to promote the above, not only for the Continent, but for home use also.

There are, however, some difficulties in an undertaking like ours, in which our trade has been in the past entirely in the home market. The large number of specialities which we make being planned on the British system, you can appreciate the difficulty of converting their dimensions to metric at once.

In view of the importance of the matter indicated by your letter, we are preparing to adopt decimal coinage and the metric system when dealing with foreign countries, and we may say that we are now opening out in this direction with a fair amount of success.

We are much obliged for your bringing this matter to our notice, and we think that under your able guidance something may be done with what is, apparently, a somewhat difficult matter.

(*To be continued.*)

THE RESEARCH LABORATORY OF THE GENERAL ELECTRIC CO., OF NEW YORK.

A recent issue of the *General Electric Review* contains an interesting description, by Mr. L. A. Hawkins, of the research laboratory of the General Electric Co., of New York, of which the following is an abstract.

This laboratory, started on a small scale 14 years ago, has grown to be one of the largest of its kind, and its work has given it a wide reputation.

Its present staff of 150 employés is now located in a modern

Fig. 1.—Research Laboratory Building, General Electric Co., of New York.

seven-story building shown in fig. 1, and occupies the greater part of four floors and the basement, a floor space of 66,500 sq. ft.

In the basement are the laboratory power plant and chemical store-room. Power is supplied from outside at 250 volts, D.C., three-wire system, and at 40 cycles, 3-phase, 120 volts. In the laboratory power plant are 16 machines which deliver power at different voltages, and at frequencies ranging from 25 up to 2,000 cycles. Through transformers, currents as high as 12,000 amperes, and voltages up to 200,000 may be obtained. A switchboard comprising 28 transfer sections makes it possible to connect any machine to any one of the 118 delivery panels distributed through the laboratory.

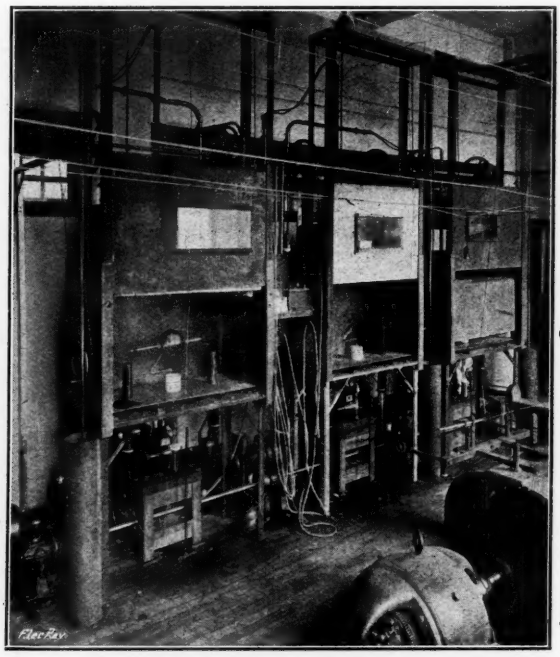
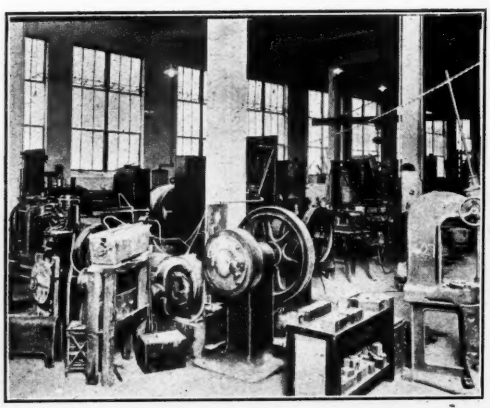
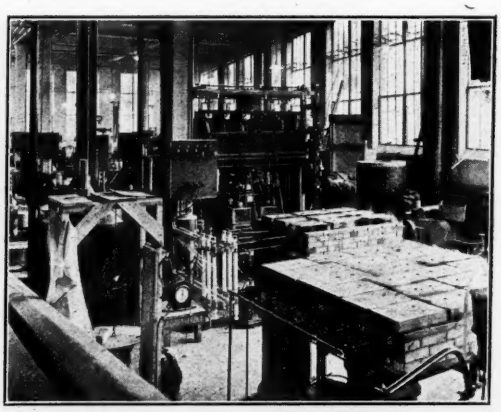


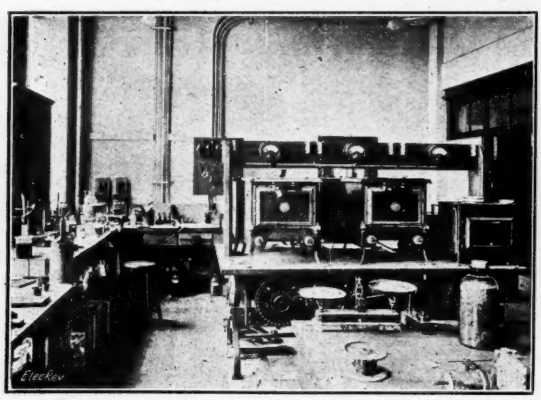
Fig. 2.—Exhaust Ovens for Coolidge X-Ray Tubes.

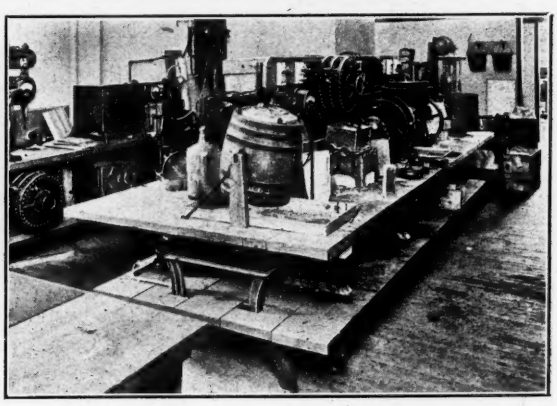
In the power plant there are also a liquid air machine, an air compressor, and two vacuum pumps, one two-cylinder, 12 in. by 12 in., and the other, three-cylinder, 8 in. by 10 in.

Figs. 3 and 4.—Views in Furnace Room.









Figs. 5 and 6.—Rooms for Insulation Work.

All wiring and piping are carried in horizontal ducts 8 ft. by 5 ft. running above the corridors through the laboratory. There are 35 miles of wire, ranging in size from No. 6 up to 2,000 c.m. The building is piped throughout with city

water, river water, illuminating gas, compressed air, vacuum, high-pressure hydrogen, low-pressure hydrogen, oxygen, high-pressure steam, and for vacuum cleaning; distilled water may be delivered by gravity to any room, and 250 motors, 80 transformers, and 60 vacuum pumps are distributed through the building.

In a one-story addition, shown in figs. 3 and 4, are located a number of furnaces, including a porcelain kiln, a frit furnace, two pot furnaces, three calorising furnaces, two brush

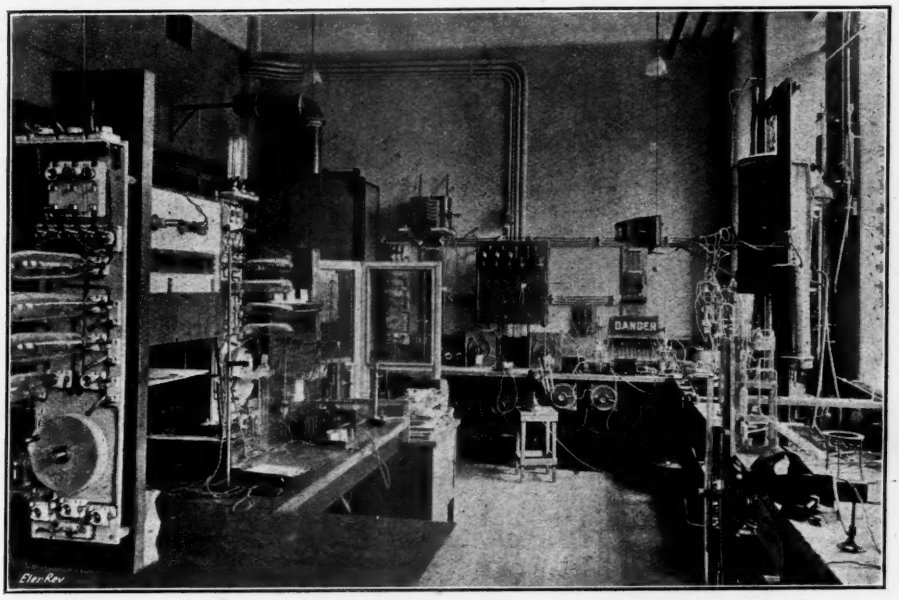


Fig. 7.—Room for Lamp Experiments

firing furnaces, all gas heated, and two large vacuum furnaces, electrically heated. There is also a furnace for argon purification. Disk grinders, crushers, a pulveriser, two large sets of rolls, 5 in. by 8 in., and four smaller sets, eight swaging machines, 10 punches, and a 60-ton hydraulic press are installed. The larger electric furnaces of the laboratory, including a two-ton arc furnace, are in a separate building.

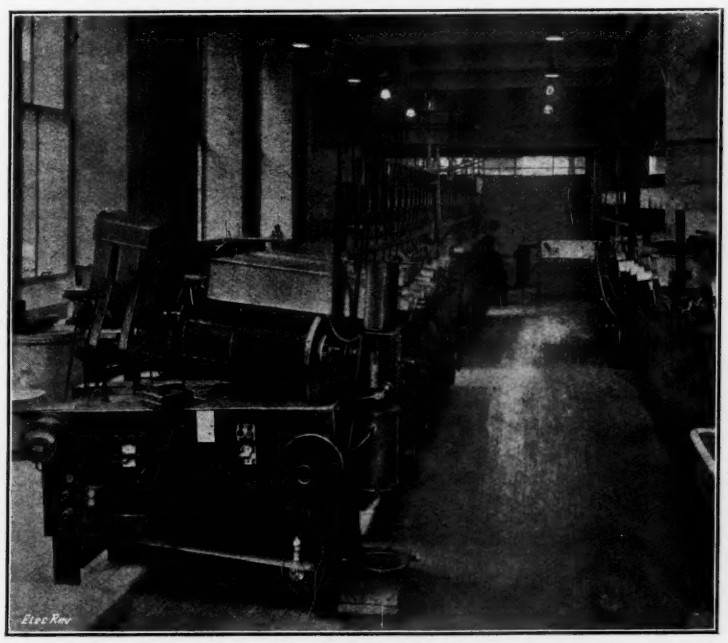


Fig. 8.—Tungsten Reduction Furnaces.

The calorising furnaces, just mentioned, are used for giving to metal parts heat-proofing treatment. The argon furnace purifies argon gas for use in experimental incandescent lamps.

On the first floor of the laboratory are offices, the library of 1,400 volumes, three experimental rooms used for X-ray investigation, and the machine shop. The equipment of this shop includes a milling machine, a lathe, 20 in. by 16 in., two smaller engine lathes, four bench lathes, a shaper, a radial drill, two drill presses, a sensitive drill, a forge, and band saw and sharpener, and 100 linear ft. of bench space.

The second floor is occupied by research work on insulation, by production work on the Coolidge X-ray tube, and by the carpenter shop. The equipment for the insulation work includes a paint grinder, barrel mixers, compound mixers, electric drying ovens, a vacuum impregnating machine, a hydraulic press with steam attachment, a 60,000-volt set for testing dielectric strength, and apparatus for measuring insulation resistance hot and cold.

Views of two of the rooms devoted to insulation work are shown in figs. 5 and 6.

Because of the importance of insulation in electrical apparatus, the laboratory continuously devotes much time to it. Many new moulded compounds have been produced, improving and reducing the cost of countless devices. Improvements have been made in varnished cloth, enamels, and other standard insulations, and new types of insulation have been developed, such as the mineral insulation used in the sheath wire now in production for heating devices.

So much has been published lately on the Coolidge X-ray tube that it needs no description here. It is manufactured entirely in the laboratory. The equipment for production and experimental work comprises a Waite and Bartlett machine, a Snook-Röntgen machine, a Scheidel-Western machine, a large static machine, a Waite and Bartlett table for fluoroscopic work, a stereoscopic display frame, a Schiedel X-ray coil, a Kelley-Koett tube stand, two Kny-Scheerer interrupters, six exhaust ovens, three of which are shown in fig. 2 equipped with Gaede molecular pumps, two Arsem vacuum furnaces, and a tungsten tube furnace.

In addition to the Coolidge tubes, the laboratory manufactures targets for the standard type of tube, comprising a tungsten disk embedded in a copper block.

The analytical laboratory is on the third floor. The work tables are covered with glazed roofing tile. There are two double hoods, a work table equipped for electrolytic work, and a draft-proof balance room.

On this same floor is the work on transformer steel and other alloys, with an equipment comprising a set of small electric furnaces for making alloys, eight small electric annealing furnaces, two vacuum furnaces, three melting furnaces, a set of rolls, a potentiometer and Wheatstone bridge, a Burrows permeability apparatus, storage batteries, a photomicrography outfit, and chemical balances. Even a slight decrease in transformer core loss is of great importance because of the enormous aggregate of transformers in use, most of

which have their supply voltage on them 24 hours a day, so that their core loss is a continuous waste. For this reason continuous research on transformer steel seems justified, even though the results seem small. As for the other work on alloys, there are always demands for new characteristics, mechanical, electrical, or chemical, so that hundreds of special alloys have been made and tested in the laboratory. Also composite metals have been developed, such as "Binel metal," that is, steel coated with a thin layer of Monel, the natural copper-nickel alloy which stands high temperatures with very little oxidation, and composite wire for special purposes, such as gold-coated tungsten and molybdenum as a substitute for platinum in dental work.

On the same floor are diamond drilling and jewel polishing machines, and apparatus for testing motor and generator brushes. The quality of the brush has so great an effect on the operation of direct current motors and generators that the laboratory has given much time to developing new grades of brushes better suited to the various machines than any grade formerly on the market. In this way they have made it possible to clean up a number of complaints on motor operation, and in other cases to improve the operation or to lower maintenance costs.

The lamp work is located on the fourth floor. From its beginning, the laboratory has devoted a large part of its efforts to the improvement of incandescent lamps, and has originated the metallised carbon filament lamp, the drawn-wire tungsten lamp, and the gas-filled lamp, thereby gradually sextupling incandescent lamp efficiency. If one stops to compare the status of incandescent lighting fifteen years ago with what it is to-day, and considers how much of the phenomenal advance has been due to those three developments, he will need no argument to convince him that the research laboratory in the electrical industry has justified its existence.

The laboratory equipment for lamp work comprises a small but complete factory for lamp manufacture with a maximum capacity of about 100 lamps per day. There are four large and four smaller exhaust ovens of standard type, three special ovens for special exhaust, a Thomson welding machine, three sets of apparatus for making arced joints, one for pinched joints, two filament winding machines, two different types of apparatus for making pure nitrogen, from air and hydrogen, and from tank nitrogen and ammonium carbonate, respectively, apparatus for purifying argon, and a gas density balance. For testing lamps there are three Lummer-Brodhun prism photometers, two portable photometers, one flicker photometer, one Lummer-Brodhun precision photometer, and an optical pyrometer for filament temperatures calibrated up to the melting point of tungsten, 3,450 deg. K. A storage battery, 30 amperes, 170 volts, is used for the photometric work. The life test has a capacity of 60 KW. and facilities are provided for obtaining voltages from 0 to 250 in one-quarter-volt steps. A Tirrell regulator maintains constant voltage on the bus-bars. Additional circuits are provided for "shop tests" of 120 volts A.C., and 125 and 250 volts D.C., and also an outdoor series circuit of 6.6 amperes equipped with compensators for the high-current series lamps.

A colour booth for studying colour values of glasses, apparatus for studying residual gases in vacuum lamps, and apparatus for photographing filaments while burning, are included in the equipment.

One of the experimental rooms for lamp work is shown in fig. 7.

There is a photographic dark room on this floor.

Part of this floor is devoted to production work, including a room for chemical purification of tungsten oxide, a battery of electrically heated hydrogen furnaces, shown in fig. 8, for oxide reduction, with a capacity of 50 lb. of metal a day, and a room for the assembly and grinding of tungsten contacts for use in spark coils, magnetos, relays, etc. One large room, of which a view is shown in fig. 9, is devoted to the study of phenomena in very high vacuum. This work has thrown much light on the characteristics of the electron emission from hot filaments under various conditions, and the results have been published in recent papers by Dr. Langmuir. The phenomena of pure electron emission, resulting from operating a hot tungsten filament in a vacuum so high that there is not sufficient residual gas to produce ionisation, have been utilised in the Coolidge X-ray tube and in the high voltage rectifier known as the kenotron. A number of improvements in wireless transmission also have been made possible by this investigation. For this wireless work a smaller room has been fitted up as a sending and receiving station, and an antenna, over 800 ft. long, composed of two wires spaced 16 ft. apart, has been strung between steel towers on the roofs of the laboratory and another building. Before this large antenna had been erected, wireless telephonic communication between the Schenectady and Pittsfield plants had been successfully obtained, and wireless messages received from Berlin, San Francisco, and Honolulu.

The laboratory is continually conducting researches of a purely scientific nature and publishing the results, in an endeavour to contribute its share to the progress of scientific thought, which is rapidly enlarging, modifying, and clarifying our conceptions of the fundamental things underlying all physical sciences. These investigations may be initiated because of their scientific interest, without any definite practical object in view, but it has been already said that every marked advance in science has resulted sooner or later, directly or indirectly, in important effects on industry, and these laboratory investigations have certainly nearly always had these practical results. The study of electron emission, and the various practical utilisations of the principles discovered, is a case in point. The gas-filled lamp, now known as the Mazda C, had its origin in the results of an academic study of the laws governing the loss of heat in small wires, coupled with the results of an investigation of the evaporation of tungsten. The metallised filament lamp resulted from experiments with a high-temperature vacuum furnace. In none of these cases was the practical result foreseen when the research that made it possible was started.

It should not be supposed, however, that all the important achievements of the laboratory have been thus brought about. Many of them, of which drawn tungsten wire is a notable example, were the result of persistent and resourceful effort directed from the beginning toward a perfectly definite goal. Other examples are the sheath wire, with mineral insulation,

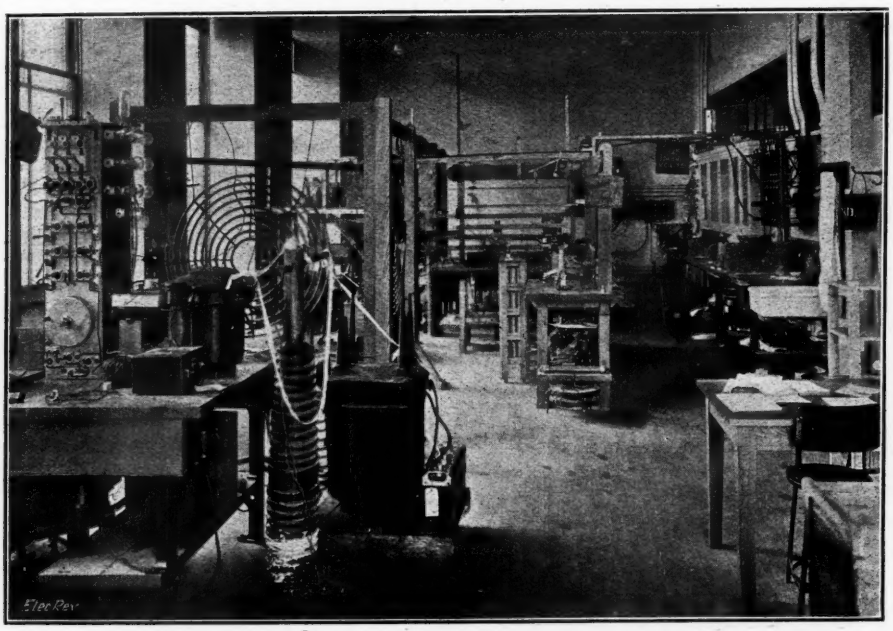


Fig. 9.—Room for Vacuum Tube Experiments.

now in production for heating devices, the magnetic electrode for luminous arcs, and the commercial development of the mercury arc rectifier.

Of course, even in those cases where unforeseen practical results are made possible by the new insight into fundamentals, gained from purely scientific research, they seldom first appear in fully developed form, like Athena sprung from the brain of Zeus, but much work, inventive and experimental, specifically directed to the end in view, is usually necessary before that end is reached.

A third kind of work which constantly requires the attention of the laboratory and occasionally demands the full application of its resources, is that which arises from the specific problems of factory production, such as the improvement of processes, the location of hidden troubles, and the development of new or better materials. Much of the work on insulations and alloys falls within this class, together with countless special investigations, each of which may be the work of a few hours or may extend over months or even years.

The General Electric Co., of New York, maintains other laboratories than the one described. There are laboratories at the Lynn and Pittsfield plants, which specialise on the production problems of those works. There are lamp development laboratories at Harrison and Cleveland which develop and standardise new processes, materials, and lamp designs, for the lamp factories. There is the Physical Laboratory at Cleveland, which conducts researches of a highly scientific order in the physical and physiological aspects of light and illumination. There is the Illuminating Laboratory at Schenectady, devoted to illuminating engineering, the selection of the best lighting unit and the best method of utilising it for a given lighting system. There is the Consulting Engineering Department Laboratory devoted to general and special engineering problems and particularly to the investigation of high-tension phenomena. There is the Testing Laboratory, investigating and testing the physical and chemical properties of materials. There is the Standardising Laboratory, in charge of the standardisation of all instruments, developing new instruments, like the oscillograph, and investigating and developing test methods. In addition to the activities of all these laboratories, the various engineering departments conduct many special tests which they are specially equipped for handling and investigations which sometimes amount to research work of a higher order. Research in general, however, is delegated to the Research Laboratory, which was organised and equipped for that purpose.

In conclusion, we are indebted both to the General Electric Co., of New York, and to its allied concern, the British Thomson-Houston Co., of Rugby, through whose courtesy we are enabled to illustrate this article.

NOTES FROM CANADA.

[From our Special Correspondent.]

The Quebec Streams Commission proposes to build a dam, on the St. Francis River in order to increase the water-power storage and tide over low-water conditions, it is said that 6,000 H.P. years will be added in this way. The estimated cost is £80,000, and the low-water level of Lake St. Francis will be raised some 27 ft.

Welland, a small town not far from Niagara Falls, Ontario, seems destined for greater things; two large companies, utilising electric power on a fairly big scale, commenced operations there not very long ago, and a third is now asking to be supplied with 4,000 H.P. Being close to the source of power, electric energy is naturally sold at a low figure there. The company last referred to is probably the one recently formed to undertake the smelting of zinc. Large quantities of this metal are mined in this country, but no smelting has been done; for this all the metal was sent into the States. As an outcome of the demands of the war, however, it has been deemed advisable by the Shell Committee that smelting should be carried out in Canada, and several plants are being erected in various places for this purpose. Brass also is to be made in the Dominion; thus, Canada will soon be making every portion of the shells she is turning out, since the manufacture of the ingredients of high explosives was commenced some time ago.

The work of the Hydro-Electric Power Commission of Ontario goes on apace. Originally, some five or six years ago, a contract for 100,000 H.P. as a maximum was entered into with the Ontario Power Co. at Niagara Falls. At the time, the contract was laughed at by many wiseacres, who declared that it would take 15 or 20 years to reach such a demand for power. Sir Adam Beck, the chairman of the Commission, recently stated publicly that the average daily power consumption during the past six months was 75,281 H.P., and the Commission is already making use of the entire 100,000 H.P. originally contracted for. The load has increased as follows since October, 1910:—

Up to December, 1912, over 38,000 H.P.
Up to December, 1913, over 48,000 H.P.
Up to December, 1914, over 70,000 H.P.

Besides, the rate of increase shows no decline.

Plans for "Hydro Radials," as they are called, being electric railways to link up practically all the more important sections of south-western Ontario, have already been prepared, covering an area nearly as large as England; and though it is unlikely that much will be done during the war, there is little doubt of this work going ahead rapidly when times become more normal.

New towns and villages are being connected up to this immense system every month almost, and in the rural districts many farmers are taking power for doing nearly all the work of the farm, greatly assisting both the farmer and his wife.

The Commission is supplying power to many municipalities for waterworks pumping, which can be done, in most cases, economically, especially if there be a high-level reservoir or an elevated water tank enabling pumping to be done during off-peak hours.

Where electric power is installed for pumping in this way, and is supplied only from one source, the fire underwriters insist that there shall be a stand-by plant. These stand-by plants are usually steam, 40 lb. or more pressure being kept up in the boilers all the year round. Keeping steam up in this way runs into a good deal of money per annum, so the Commission is now making a trial of the use of centrifugal pumps direct-coupled to high-speed gasoline engines, instead of steam plant, thus reducing stand-by charges almost to zero. For small towns, up to 15,000 or 20,000 inhabitants, there is every prospect that this arrangement will prove very satisfactory. Such gasoline-driven sets have other advantages over steam plant in that they take up very much less space and are cheaper in first cost.

Canada is known to have plenty of water power, but the following seems to show the fact up pretty clearly, especially as applied to the vicinity of Vancouver:—The City of Vancouver, wishing to own its own electricity supply, recently tried to get information regarding suitable sites. No less than seven proposals were made to the city offering water powers within 180 miles; the power available varied from 3,000 H.P. to 100,000 H.P.

It is not often that one hears of a Spanish company securing an order for engineering work in any British territory, but it is announced that the Niagara Spanish Aero Car Co., representing the Estudios y Obras de Ingenieria, of Bilbao, are building an aerial railway across the Niagara Whirlpool; the span will be about 1,800 ft. The line will be erected for sight-seeing, and it will be operated by a 200-H.P. electric motor; about 30 people will be taken in the car at one journey. Anyone who has seen the whirlpool and its surroundings can imagine what it would feel like to be hanging over the top of it.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Edinburgh Extension.

The appeal for more munitions, which you make on page 482 of the current issue, is one which in the North, at any rate, is being made to everyone who can help at all; and yet, on turning to page 512, we find that Vickers—of all people—are allowed to undertake the manufacture of alternators for an ordinary municipal extension. Had the plant been for Sheffield or Barrow, one could better understand it; but Edinburgh; ye Gods!

From various advertisements one gathers that all important armament firms are in urgent need of men for actual munition work, but by no stretch of imagination can one see that this plant could be brought under this heading. If additional machinery be wanted for the factory now being built, surely temporary plant of some kind could be laid down.

One hears that the country is now being organised on efficient lines in order to win and end the war. Is this a sample of it?

W. H. B.

The A.E.G. Meeting.

Seeing "Union Jack's" letter in this week's Review *re* the superiority of British electrical machinery, I should esteem it a great pleasure if you could spare me a few lines. The writer has been ten years in a large mill in the North—five as shift engineer and five as electrician, doing the rewinds, repairs, etc., etc. Our firm has about 300 3-phase motors in use from 160 H.P. downwards; about one quarter are German (Union Co.) and three-quarters British. A few weeks ago the writer counted seven Unions in for rewind and one British, this allowing for the numbers in use, is 21 : 1 against the German motor!

In another case we had a 7½-H.P. Bruce Peebles motor on a heavy gear drive for five years; taking it away for thorough overhaul, we installed in place of it a 9½-H.P. Union motor; it was literally all to pieces in three months!

E

We have had in use four generators of British make for from six to ten years; in no case have they needed electrical repairs, and the only mechanical repair was a small exciter shaft snapping at a flaw; these machines run night and day. Lately a foreign generator has been put into use; it burnt out on its trial run at one-third full load after running four to five hours. Another case: This week we removed a 15-H.P. E.C.C. motor that has been driving a fan for eight years, night and day, for overhaul; the bushes did not need renewing. Most of our Union motors run their rotors on their stators in less than six months!

When a report of a breakdown comes in our shop, the cry is "Another Union motor, I suppose?" We have no other make of German motor in use, so that the writer cannot say for other makes. These few facts can be vouched for by at least a dozen electrical men.

British Electrician.

In spite of the correspondence in your columns, the Electrical Co. are still busy striving to unload their wares upon an unwilling public. Only this morning we have received a trade price list from this firm. We sent it back to them with a covering letter, in which we stated that we had no intention of doing any business in future with German firms, and, moreover, we should refrain from trading with English firms who were supplying their company with goods. We hope other electrical contractors will adopt a similar course.

E. P. Allam & Co.

London, W.C., *October 12th*, 1915.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Hoffmann Roller Bearings.

We illustrate in fig. 2 the application of roller journal bearings and a ball thrust to the shaft of an electrical machine, by the leading British makers, the Hoffmann Manufacturing Co., Ltd., of Chelmsford.

The superiority of the short roller over the ball bearing for carrying the journal load (except in the case of small motors) is now generally recognised, and such short roller bearings are shown in our illustration. The shaft is located by means of a double thrust bearing; for normal conditions quite a small thrust bearing is sufficient, but where the thrust load from gearing has to be dealt with, the size must be increased accordingly. The bearing parts are guaranteed by the makers to very fine limits, and with reasonable accuracy in the machining of the shafts and housings —such accuracy as is possible in any well-equipped machine shop—success is assured.

It is claimed that there will be no measurable signs of wear in these bearings after years of running, provided they are kept clean. To ensure this the best practice is stated to be to keep the end covers of the pedestals where they approach the shaft as broad as possible. These covers should be bored not more than ·004 in. larger than the shaft diameter (the absence of wear in the bearings makes this perfectly feasible) and a number of grooves or recesses—not a thread—turned in them. If grease is forced into the housing until it exudes at these covers, it will help to keep the bearings free from foreign matter. Where the machines are to run in specially dusty positions, extra precautions may be taken. Particulars as to the proper allowance for the press fit of the inner race and the other parts are readily furnished by the Hoffmann Co.

We understand that a number of well-known makers are now using the Hoffmann bearings on all their machines, and that practically all others are prepared to quote for machines so fitted, and show a tendency to use them more and more extensively every day. The advantages of reduction in friction, particularly in starting effort; grease lubrication instead of the old troubles from oil working its way into the windings; perfect reliability and freedom from breakdown under continuous working conditions—an increasing number of motors are kept running practically 24 hours a day under present conditions, is causing users to pay more attention than previously to the type of bearing fitted. The complete absence of wear permits of a smaller air-gap, and the roller bearing machine is also much neater in appearance and shorter. Manufacturers who are using the bearings as standard practice confirm that a roller-bearing machine can be produced more cheaply than one fitted with plain bearings; there is a considerable reduction in fitting and machining expenses. On a vertical machine the ball or roller bearing is almost essential from the point of view of the difficulty of retaining lubricant that is always a feature of plain bearings.

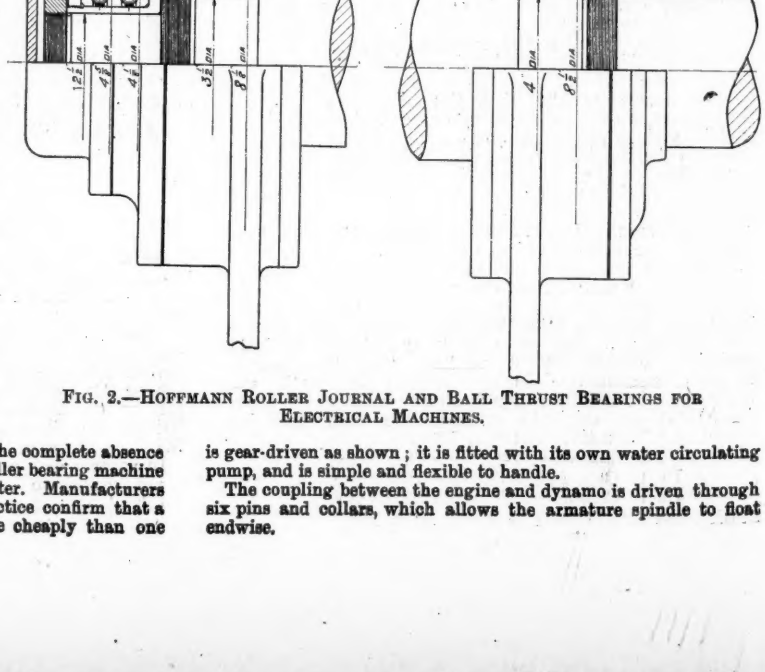


Fig. 2.—Hoffmann Roller Journal and Ball Thrust Bearings for Electrical Machines.

Parsons Paraffin Lighting Set.

Amongst the firms who have had many years experience on turning out an engine fit for continuous full power duty is the Parsons Motor Co., Ltd., Town Quay Works, Southampton, so well known in connection with paraffin machinery for marine propulsion. We illustrate a plant by this company, of 3½-kw. output; the engine is coupled to a Mather & Platt dynamo, and the normal speed is only 900 r.p.m. The working parts of the engine are the same in size as the marine engines, which are built to pass the requirements of all authorities.

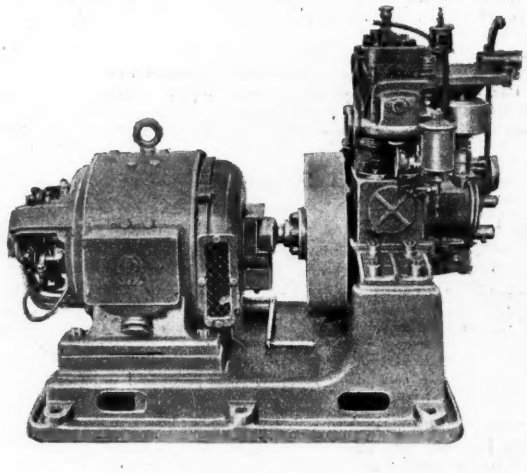


Fig. 1.—3½-kw. Parsons Petrol-Electric Set.

This particular plant is one of three for country house lighting, but the company has built many very much larger plants, up to 90 h.p., for various military camps about the country, in some cases there being half-a-dozen large engines in one generating station.

The engine is remarkably clean in running, and closely governed by means of the company's enclosed high-speed governor, which is gear-driven as shown; it is fitted with its own water circulating pump, and is simple and flexible to handle.

The coupling between the engine and dynamo is driven through six pins and collars, which allows the armature spindle to float endwise.

Advertising Window Signs.

Fig. 3 shows a window sign designed and made by Simplex Conduits, Ltd., of Garrison Lane, Birmingham, for the new showroom of the Glasgow Corporation Electricity Department, which was opened last week. During the present trying times for shopkeepers, when the lighting restrictions in large towns are strictly enforced, it is useful to remember that windows lighted in this way are well illuminated without flooding the street with light or half blinding the observer.

Fig. 3.—Simplex Window Sign.

WAR ITEMS.

Contraband of War.—The *London Gazette* for October 15th contains a new Proclamation, revising the list of articles to be treated as contraband of war. In Schedule I are enumerated the articles that will be treated as "absolute contraband," and in Schedule II those to be treated as "conditional contraband." They include the following :—

Schedule I.

Lathes and other machines, or machine tools capable of being employed in the manufacture of munitions of war.

Emery, corundum, natural and artificial (alundum), and carborundum in all forms.

Range-finders and their component parts; searchlights and their component parts.

Submarine sound-signalling apparatus.

Motor vehicles of all kinds, and their component parts.

The following metals :—Tungsten, molybdenum, vanadium, sodium, nickel, selenium, cobalt, hæmatite pig-iron, manganese, electrolytic iron, and steel containing tungsten or molybdenum.

Asbestos.

Aluminium, alumina, and salts of aluminium.

Antimony, together with the sulphides and oxides of antimony.

Copper, unwrought and part wrought ; copper wire ; alloys and compounds of copper.

Lead, pig, sheet or pipe.

Tin, chloride of tin, and tin ore.

Ferro alloys, including ferro-tungsten, ferro-molybdenum, ferro-manganese, ferro-vanadium, and ferro-chrome.

The following ores :—Wolframite, scheelite, molybdenite, manganese ore, nickel ore, chrome ore, hæmatite iron ore, iron pyrites, copper pyrites and other copper ores, zinc ore, lead ore, arsenical ore, and bauxite.

Schedule II.

Fuel, other than mineral oils.

Railway materials, both fixed and rolling stock, and materials for telegraphs, wireless telegraphs, and telephones.

Russian Electrical Industry.—At a recent meeting of the Weak Current Section of the Central Military Industrial Committee, the question of the requirements of the electro-technical industry in Russia was considered. The President stated that the weak current industry in Russia was satisfactorily established, as for many years past both telegraphic apparatus and signalling apparatus had been made in Russia, thanks to the Chief Department of Posts and Telegraphs and the Marine and Engineer's Departments, which gave their orders exclusively to Russian factories. The Ministry of Ways of Communication, on the contrary, very frequently gave the orders to foreign houses for many items. It was explained that the development in the production of various apparatus was obstructed by the scarcity of raw materials and motors. Great need was experienced in respect to ebonite, iron and carbon, also silk for insulators, in the cable works. Considering the difficulties in connection with the provision of labour, it was decided to agitate for a change in the law respecting the employment of female and minor labour. At the meeting at which the foregoing was stated, it was shown that, thanks to the changes in the technical conditions demanded by the Departments, the productivity of the factories had grown by 50 per cent. A desire was expressed for the suppression of the fines introduced by the Departments for the unpunctual execution of orders, which, as a matter of fact, are altogether abortive, for the penalties are really paid by the Treasury itself; the manufacturers take good care to calculate a percentage in their prices to stand against such fines. A great hindrance to the development of the electro-technical industry consists in the requirements of the departments for apparatus to be made in types known only to certain firms. The section confirmed the suggestion which has been frequently raised regarding the necessity for a complete change in the qualifications for workmen and specialists in the electrical branches of the Army. It was shown that during the war a whole series of important productions that had not existed before the war had cropped up in Russia. Thus, for example, the firm of Siemens & Halske are now making Röntgen regenerator installations better in quality than those made abroad. The factory of Phedoratzky is making Röntgen tubes, &c. Besides this, two firms have come into existence for the manufacture of measuring instruments which were not produced in Russia previous to the war. The question of the causes why the production of small motors of a quarter to half horse-power had not been solved in Russia before the war was explained by the absence of an effective Customs system in Russia, at all events in respect to these goods. The section declared itself in favour of establishing differential tariffs for the importation of engines and motors into the country.

British Exports and the American Exchange.—The American Exchange rate difficulty was discussed at a recent meeting of the executive council of the Associated Chambers of Commerce of the United Kingdom, and a resolution was passed in which the opinion was expressed that among the methods available for the purpose of meeting the difficulty are :—

(*a*) The reduction of the importation of articles of luxury by means of import duties, at least during the period of the war.

(*b*) The stimulation, on the part of the British Government, of the export of goods produced within British territory—such stimulation to take the form of assisting commercial effort.

(*c*) Inasmuch as debts due to Great Britain in the form of American Railroad bonds have been purchased in this country for export and sale in America as a means of adjusting the trade balance against Great Britain, steps should be taken to supplement or substitute the export of capital in the form of securities by the export of merchandise.

Tramway Supplies in War Time.—In the October number of the *Tramways and Light Railways Association Journal* it is stated that in view of the difficulty experienced by members in obtaining supplies of steel tires and other materials during wartime, the Council has appointed a Special Committee to deal with the matter. The Committee consists of Messrs. Harry England, Fred Bland, and J. B. Tippetts. Members of the Tramways and Light Railways Association are requested to communicate particulars of any difficulties that they may be experiencing in the above connection to the Secretary of the Association.

Australian Metal Refining.—A Reuter dispatch from Melbourne states that as the result of conferences of the interested parties, Mr. Hughes announced last week that arrangements had been made whereby the whole copper output of the Commonwealth suitable for electrolytic treatment would be treated in Australia. He also announced that a British group had secured the Imperial Government's approval of their suggestion to distil in Great Britain the whole Australian output of zinc concentrates.

Prohibition of Steel Exports?—It was stated in Scottish iron and steel circles on October 13th that, so pressing is the Government demand for iron and steel, than an embargo is to be placed on exports of steel. This probability is being forced upon the Government, as deliveries are falling far behind in consequence of all makers having a surfeit of orders. It is already assured that the output for the current year will far eclipse anything in the history of British trade.—*Financial Times.*

From the Front.—Another of our readers with the British Expeditionary Force in France writes under date October 11th :—"It is very refreshing to have your journal again, to read notes and news relating to the electrical world. I assure you that the weekly copies will be looked forward to here, and will meet with a warm welcome."

LEGAL.

Mexican Light and Power Co.

In the Chancery Division last week, on a motion on behalf of T. G. Scott, a receiver was appointed of any assets of the above company in this country.

Dealings in Marconi Shares.

In the Court of Appeal, on Friday, October 15th, before Lords Justices Swinfen Eady, Phillimore and Pickford, the hearing was commenced of the appeal by Mr. Samuel Segar, a shareholder in the English Marconi Co., in the action which he unsuccessfully brought against Mr. Godfrey Isaacs for alleged breach of an agreement to take over certain shares, or to pay the difference between their purchase price and sale price.

Mr. Leslie Scott, K.C., Mr. Gordon Hewart, K.C., and Mr. Beazley appeared for the appellant, and Mr. Greer, K.C., Mr. Schwabe, K.C., and Mr. Arthur Sims for the respondent.

Mr. Gordon Hewart opened the appellant's case. The hearing was continued on October 19th and 20th, and it is expected to occupy some days further.

Newhours and Others *v.* Northern Light, Power and Coal Co., Ltd.

In the Chancery Division, Mr. Justice Younger heard this action, in which the plaintiffs, as holders of first mortgage bonds in the defendant company, sought to compel the company to call a meeting of bondholders with the object of removing the present trustees and appointing new ones.

The company, which was Canadian, had its offices, and held its meetings, in London, and it was formed for the purpose of supplying light and power to Dawson City, with works and plant in the Yukon territory. In June of 1909 it issued first mortgage 5 per cent. debenture bonds to the amount of $2,500,000, and by a trust

deed these bonds were secured on all the property of the company. It was provided by the trust deed that the trustees might, at the request of the company, or if 75 per cent. of the bondholders stepped in to protect the property of the company, convene a meeting of bondholders. The plaintiffs claimed a declaration that under the provision the company should convene such a meeting, or, in the alternative, that the Court should grant an injunction restraining the calling of any other meeting to consider the matters referred to in the plaintiffs' requisition.

The defendants did not deny their refusal to call the meeting required by the plaintiffs, and persisted in their refusal to call such a meeting. Their case was that the plaintiffs' requisition was not a proper one, and that the meeting if called would be ineffective, as it would have no power to do the acts and things specified as the objects of the meeting. It was further alleged that one of the plaintiffs had been notified of the company's intention to call a meeting, and the meeting was in fact called by notice dated March 17th. The main question was the inability of the meeting to carry out its proposed objects, and it was argued for the defence that the Court had no power to make a mandatory order on the company to call a meeting.

On Wednesday his LORDSHIP delivered his reserved judgment. He held that the plaintiffs were substantially right and the defendants substantially wrong throughout the proceedings, and, although he did not think that any useful purpose would be served by ordering a meeting to be convened now, the plaintiffs were entitled to a declaration that the company were bound to convene a meeting of bondholders of the company in compliance with the plaintiffs' requisition of June 21st. The company must pay the costs of the action, which would include the costs of the preliminary motion that had been made.

BEATTIE *v.* BARTON WRIGHT.

BEFORE Mr. Justice Ridley and a special jury in the King's Bench Division on Tuesday and Wednesday, Mrs. Ellen Eliza Beattie, of 131, Maida Vale, N.W., brought an action against Mr. E. Barton Wright, of Pembroke House, Oxford Street, W., claiming damages for personal injuries alleged to have been sustained while receiving electrical treatment for rheumatoid arthritis in the knee.

Defendant denied that he was proprietor of this electrical system for treating disease, and said that any contract entered into was on behalf of the Radium Electro-Emanation Co., Ltd., of which he was a salaried servant. He denied liability, and said that if Mrs. Beattie was injured the burn was caused solely by her negligence, in that she had been verbally warned before treatment of certain possible dangers. Mr. G. Thorn Drury, K.C., and Mr. R. P. Croom Johnson were counsel for the plaintiff, and Mr. David White appeared for the defendant.

COUNSEL, in opening the case, explained that Mrs. Beattie saw a circular of what was there called the Bartitsu Institute, containing a number of testimonials, and she was favourably impressed by what she read there. The circular indicated that the Institute was a palatial affair, whose upkeep, Mr. Barton Wright stated, cost £7,000 a year. Plaintiff called about October 30th, 1914, and the defendant undertook to give her treatment, for six guineas, by three different methods—diathermy, by which a high electric current was passed through the affected joint; a light bath; and rotary massage. Mrs. Beattie was asked to bear as much heat as she could while the electric current was being applied; and the method was that moistened pads were placed on either side of the knee, and the current of electricity was delivered into these pads. Mrs. Beattie called out more than once during the operation. Mr. Barton Wright was described as a gentleman of magnetic personality. Something must have interfered with his magnetism on this occasion—for he was nagging at the nurse during the whole time the treatment was going on. At its conclusion Mrs. Beattie noticed that her knee was red and inflamed. She proceeded from the institute to the Florence Nightingale Home, where a daughter of hers was undergoing an operation, and there showed her knee to the nurses. They sympathised with her, and dressed it for her. Mrs. Beattie persisted in the treatment for several days, and felt some sort of temporary relief from it, as she was informed would be likely; but a burn developed, and an electrical burn took a long time to heal. She was in bed five weeks as a result, and during that time had to be lifted in and out of bed. This was in consequence of what Mr. Barton Wright described as a "soothing and exhilarating treatment."

Giving evidence, the PLAINTIFF declared that during the treatment Mr. Barton Wright was in a particularly bad temper, and the nurse, who applied the electricity, was extremely nervous in consequence. She felt very sorry for her.

MRS. BEATTIE, in cross-examination, admitted that on a previous occasion she had received electrical treatment under another system, when she suffered certain effects of burning.

His LORDSHIP (to Mr. White): Do you put that forward as any reason why you should burn her again?

MR. WHITE replied that he was seeking to show that Mrs. Beattie knew there was a possible risk of burning by electrical treatment. The defendant told her he could have put the matter right at once if she had gone to him instead of accepting treatment for the burn elsewhere.—The hearing was adjourned.

OSRAM LAMP WORKS, LTD., *v.* POPE'S ELECTRIC LAMP CO., LTD.

THIS action was mentioned in the Court of Appeal to the Master of the Rolls and Lord Justices Bankes and Warrington, when by arrangement between the parties, their Lordships directed that the hearing of the appeal from the recent decision of Mr. Justice Joyce should not commence before November 8th.

SUNDERLAND *v.* ECONOMISERS, LTD.

THIS action was before Mr. Justice Ridley and a special jury in the King's Bench Division, on Tuesday, October 19th. The case was the suit of Mr. Wallace Sunderland, of Horringham Terrace, Leeds, against Economisers, Ltd., of Queen Victoria Street, London, claiming damages for alleged wrongful dismissal from his post of sole selling agent for the company in the area of Yorkshire, Derbyshire, Nottingham and the City of Lincoln. The defence was that his dismissal, on April 4th, 1913, was in accordance with the terms of his agreement of April 18th, 1912, and in consequence of the fact that he was not carrying out his duties satisfactorily.

MR. MCCALL, K.C., for the plaintiff, read letters in which the chance of supplying economisers to various electricity works was discussed, including the electricity works at Halifax. One letter from the defendants to their agent, dated May 3rd, 1912, said:—"Probably you have seen the advertisement in the ELECTRICAL REVIEW inviting tenders for a 360-tube fuel economiser for the county borough of Halifax tramways, Mr. W. M. Rogerson, M.I.E.E., borough electrical engineer." These economisers, said Mr. McCall, consisted of an arrangement of tubes in series placed at the end of the boiler, which raised to a high temperature the water which was passed into the boiler, and used the waste gases from the furnace for heating the water so passed to the boiler. There were various economisers on the market, and they effected a great saving in fuel and provided an extremely profitable trade for established firms which dealt in them. They were in request in connection with electrical plant, and at other important works. The plaintiff had been with Messrs. Green & Co., manufacturers, Wakefield, and Economisers, Ltd., were incorporated, about the time of Mr. Sunderland's appointment as agent, to get as much as they could of the trade in economisers which had gone to Messrs. Green and to other makers. One of their letters to the plaintiff said: "We want to supply economisers in the West Riding to show Messrs. Green we can compete with them, so to speak, at their own back door." Mr. Sunderland was appointed not at a salary, but for five years on a 5 per cent. commission on the net cash received by the firm for the business he obtained, with a proviso that in respect of all economisers sold to boiler-makers and engineers the commission should be 2½ per cent., and that no commission should be payable on orders received for economisers from boiler and steam-engine insurance companies in the area, unless the economisers were to be installed in the area.

PLAINTIFF stated that he was handicapped in the beginning by the lack of printed matter, and the delay in producing an economiser which could be pointed to as a sample, and he did not get fairly to work until December.

In answer to Mr. Clavell Salter, K.C., in cross-examination, he admitted that defendants wrote complaining that they could not get answers to their letters or detailed accounts of the firms on whom he called. He had promised, he explained, to report when there was anything to report. He received in February a letter informing him that other agents made weekly reports, and if the defendants could not get detailed statements from him, they must ask him to give up an agency which was both useless to himself and to them. In answer to that, on March 11th he sent a Telephone Directory for the West Riding, with the names of various firms marked in red ink on whom he had called.

MR. JUSTICE RIDLEY: In plain English, what was the use of sending a book like that?—Plaintiff, answering a further question by his Lordship, said he was also travelling in superheaters and trying to get orders for furnaces, but this business did not clash with his canvass for economisers. He made four or five hundred calls in the entire district. It took a year or two to build up a connection for a new article like this when the district was already well supplied with economisers, and a £200 economiser would last 20 years.

The Jury stopped the hearing on the conclusion of the plaintiff's evidence, and said they were satisfied he had no case. His Lordship accordingly entered judgment for the defendants.

BROOK *v.* BURNARD.

AT the Lambeth County Court, before Judge Parry, on Monday, Messrs. E. Brook, Ltd., engineers, of Haddersfield, brought an action to recover £27 10s. from Messrs. Burnard & Co., Ltd., described as dairy engineers, of Lambeth, S.E., being the price of a 6-H.P. motor, with starter fitted with no-voltage release and pulley. Defendants did not appear, nor were they represented. Mr. Tetlow, solicitor for plaintiffs, said the motor was required for refrigerating purposes. The defendants had written a letter stating that the motor was not ordered by them, but they had not put in an appearance. Edward Hopkinson Smith, on behalf of plaintiffs, formally gave evidence of the ordering by, and delivery to, the defendants of the motor.

His HONOUR gave judgment for the plaintiffs for the full amount claimed, with costs.

ADNIL ELECTRIC CO., LTD.

IN the Companies' Winding-up Court on Tuesday, the petition of the Acme Electrical Manufacturing Co. for a compulsory order to wind up the Adnil Electric Co., Ltd., came before Mr. Justice Astbury. Counsel stated that petitioners' debt was £58. The respondent company was insolvent and could not carry on business. All the officials were resident in Germany. A provisional liquidator had been appointed.

His LORDSHIP made a compulsory order.

THE SALESMAN.

By E. P. BENNETT.

The salesman may be considered the life-sap to any concern, as upon the results of his activities the success of all industries depend. The manufacturer can produce efficiently and in abundance, but if the manufacturer is not supported by the efforts of a carefully-trained salesman for the disposal of the materials produced, at profit-bearing prices, the manufacturer's position is one of uncertain speculation. Advertising will do much to help, but the somewhat indefinable personal touch of the salesman is required to make for the certainty of a lasting success.

How best can the salesman be trained for his particular duties? The methods adopted in the U.S.A. are very thorough and elaborate, and might appeal to many in this country who realise the successes obtained by that country generally in the commercial world. The American manufacturers will probably select from the Universities the well-educated, whose appearance and bearing make them more than ordinarily attractive, and starting with a course in the factory, they will see that the future salesman is made fully acquainted with the methods of production, handling, packing and dispatch. In fact, the training means actually working for a definite period in each of the departments mentioned, and going from there to a course through the administrative offices, and on to a special preparatory school where set methods of approach, attack, and the displaying of samples, are learned. The student is finally made to go through the performance of obtaining an interview, and rehearsing the firm's special mission to one of his own directors, with the intention of selling as to an actual client. The defined lines of approach, the set formula, are recited, and arguments advanced, all upon the lines of the previous instruction right up to the "good-day" and exit. Until the salesman is considered efficient, the training is continued. This method must be of immense value, especially so with works and office experience, but it can by no means ensure success of the learner's ensuing efforts, as character and temperament finally play an important part.

This is perhaps more marked when the markets to be opened lie in this country. Here the buying is more often done by the various heads of the firm or department, than by the specialised buyer, who, trained for his work, is not so readily affected by the salesman's personality and general bearing, as by his clear and concise methods of introducing and displaying his goods.

A salesman in this country is too often selected for reasons quite apart from considerations of suitability for the position. When using the word "salesman," it is intended to convey the meaning of travelling representative rather than the inside departmental man, for whose training it is necessary to proceed on quite different lines.

The really successful salesman is born and not made. The first essential to success must be a real desire to cultivate the art—for an art it is—training, as in all art, being necessary to bring to perfection the latent capabilities, which, if they do exist, will quickly make their appearance, and, being noted, opportunities given to acquire the necessary knowledge to enable the individual to pass into his proper sphere. This knowledge could well be imparted on the lines adopted by the manufacturers in the States, but without the degree of rigidity which renders the future working mechanical, with the possibility of resulting in incessant repetition of the acquired formulas, regardless of the temperament, character, or station of the interviewed. The training would probably cover a period of three years, towards the end of which the learner should be given interviews of minor importance, being brought into touch first with the clients visiting the works, from then to the smaller buyers in the locality, and, if possible, under the guidance of an experienced salesman, well up to the ways of the road, a knowledge of which can only be gained by experience.

Prior to the commencement in earnest, the now trained salesman should be interviewed by his principal, and carefully instructed in his new duties, the principal clearly indicating the limit of the salesman's authority, the scope of his abilities, and, not least in importance, the many dangers that will be encountered by a young salesman now left to his own resources, away from the supervision of his former instructors. A word of warning from the principal at this important period will often prove the starting of a successful career, and is too often omitted by the directors of English companies, which is probably due to their reluctance to seemingly interfere in any way in the private affairs of their subordinates. It must be remembered that the "representative is the firm," and as such their conduct should not, through ignorance, be allowed in any way to reflect to the discredit of the firm.

A year's working would generally be sufficient to determine whether the salesman is specially adapted for pioneer work or district travelling, and his subsequent duties will be shaped accordingly. The future now rests with the man himself, who must cultivate adaptability, rapid perception of character, as in no two interviews will he encounter the same temperaments. The buyers' moods must be carefully noted and interest taken in his sports, or hobbies, and the best times to seek an interview recorded. The districts to be opened up should be carefully tabulated, and names and addresses of firms, departmental buyers, and times for interviews, recorded on a card-filing system, an outline of the results of each interview being entered on the cards. Readiness to impart useful information regarding your own manufactures, and a good knowledge of your competitors' materials and ruling market prices, are all valuable assets to good salesmanship, and tend to secure the goodwill of the buyer, and will, with polite perseverance, be sure to secure accounts of value, and a repetition of orders.

Having procured a good connection the salesman should be carefully watched by means of the daily reports issued to the head office, and a weekly inspection of the card file, against the possibility of "resting," or the tendency of the salesman to become too set with one particular clique to the avoidance of the more difficult and less congenial interviews, remembering, while your good friends will look after your interests, you have to look after the interests of the others to maintain even a possible chance of "getting in" and securing orders. Should the tendency to rest become marked, and a friendly warning from the directors go unheeded, a change of locality to be worked, or a short period put in at the factory or office, will often bring the salesman up to his original enthusiasm. When possible, an encouraging word from the directors should be given, as to-day the work of a salesman is especially hard, and the results of a week's rebuffs are bound to reflect in the working of the man. This depression can often be cleared away by a few well-chosen words from the "chief."

Where firms employ more than one salesman, opportunities should be given for intercourse between them at least every quarter; the idea adopted by some firms of calling a meeting with the directors and departmental managers in attendance, is a good one. The ideas collected are useful, both for the salesmen and for those on the manufacturing side.

Remuneration of the salesman is not being dealt with here. It depends too much upon the class of concern to which the salesman is attached. The set salary and expenses plus a commission on the turnover above a certain figure, is probably the best of all arrangements, and calculated to meet the interests of both sides.

It will be found advisable in the early days of the salesman for the firm to name the hotels in the various localities visited, where the salesman is to make what is in effect the firm's address during the visit to the town being worked. This is not a difficult matter, and is a point of probably more importance than some concerns seem to believe by their apparent lack of interest in the matter.

If the salesman does not show up to advantage in the first year of his working, a different locality might with advantage be given to him. If in the new district no signs of success are indicated, it may be taken for granted that the man's proper vocation has been missed, and dealt with accordingly.

Unfortunately, some salesmen soon fall victims to the well-worn cry of "Price." Where there is known to be good business obtainable, and provided the quality of the firm's manufactures is right, and their service is good, this

cry should be promptly stopped. It does not want a salesman to dispose of the cheapest materials. The price cry is really a disease of the salesman, and, like laziness, requires effectively dealing with.

With the goods up to market standard, backed with prompt dispatch and efficiency in the counting house, with attention given to the requests in the daily reports, success then lies with the salesman, who, working quietly and conscientiously, making the best use of his personality and persuasive powers, together with his knowledge acquired through his special training, will make for the success of his own career, and secure dividends for his firm.

The influence of such a salesman will be felt years after the man has retired. The newcomer will get perhaps a little tired of the many kind inquiries after his predecessor, but how much these inquiries will reflect to the credit of the salesman, and their value and help in maintaining the company's turnover, only the firms who have been fortunate enough to retain the services of such a salesman really know.

BUSINESS NOTES.

Consular Notes.—CHINA.—Consul-General Sir E. H. Fraser, in his report on the trade of Shanghai for 1914, refers to the period as one of depression, showing a decrease of 5,000,000 taels in imports and one of 30,000,000 taels in exports as compared with 1913. The initial causes of the restriction of trade were local and direct—a prolonged drought impeded transport on the inland waterways, the terrorising march of the brigand White Wolf, and the seige of Tsingtau and the military operations in Shangtung, which affected the railways and coasting lines from the North, for which Shanghai is a terminus. The indirect causes were even more important than those arising from the local unrest. The European war was the principal factor in disturbing the commercial life of the port. The Consul refers to the effect of war conditions in their bearing on these remote markets of China.

The heavy fall in exports can be traced to the difficulty of financing cargoes at the moment when the China staples were ready for shipment; the complete removal of German shipping from the China seas and the reduction of British tonnage—owing to the deflection of many vessels to the service of the State—resulted in an ultimate increase of rates by 115 per cent. on seeds and 40 per cent. on general cargo as compared with the quotations in February, 1914. A drop in exchange followed as a natural sequence of war conditions, the rates for telegraphic transfer falling from 2s. 7⅛d. per tael in May to 2s. 1⅛d. in November, thus handicapping the importer of foreign goods, whilst exporters were unable to take advantage of the situation owing to lack of tonnage and lack of demand. In view of the fact that the Shanghai market is so closely linked with the markets in Europe it is only surprising, when reviewing the trade of the year as a whole, that the situation was not more disastrous. One is forced once more to the conclusion that there is great resilience in the China market, and that it is able to weather heavy storms.

The Shanghai merchants have encountered many adverse circumstances during the past few years. The revolution of 1911-12, the collapse of the rubber boom, the failure of the native banks, the second revolution and considerable over-trading in 1913, have all tended to shake the stability of the market and, when news was received of the outbreak of war, the graveet apprehensions were felt as to the effect on the trade of the port.

These apprehensions were to some extent justified. Merchants have suffered, and China has borne some share of the common war burden. At the same time the lull has proved beneficial in many ways; it has prevented the over-trading to which this market is somewhat prone; it has resulted in the melting down of considerable quantities of superfluous coins, and has thus improved the currency situation; the business of the native banks has been conducted on sane and cautious lines; and the foreign banks have had ample funds at their disposal and have encouraged all legitimate business. The close of the year indeed showed a sounder tone in the market than has been experienced for several years and, if only Shanghai is willing to work slowly and steadily through the war period, there is every prospect of great commercial development in the near future.

The conservative methods of British merchants have shown considerable modification in the last few years under pressure of severe competition from their commercial rivals. Closer co-operation, a fuller knowledge of conditions in the interior and a more thorough appreciation of the needs of the Chinese market are already producing good results, and the conditions of the trade conducted from this centre demonstrate that the British merchant is inclined to do better business when stimulated by the pressure of adverse circumstances.

British firms in the United Kingdom, or in other parts of the British Empire, who are desirous of obtaining information in regard to this market, or of finding openings here, are recommended to apply either to this Consulate-General direct or to the Director, Commercial Intelligence Branch, Board of Trade, London. Questions as to trade conditions and openings in specific lines should be clearly defined; it is impossible to deal satisfactorily with requests for general information.

Reference is made to the important part which is being played by local industries. During 1914 almost all the mills added considerably to their spindles, additions were made to existing plant and machinery, and new mills were erected. "There is no doubt that the Chinese are improving their methods of management, and the Japanese are taking a very active part in this industry in Shanghai."

Iron and steel bars, plates, angles, &c. In the early part of 1914 very low quotations were being made for this class of material, mostly by Continental works, and large contracts were booked for shipment up to and including January, 1915. Orders for Shanghai storekeepers alone amount to, roughly, 5,000 tons, a quantity far in excess of normal demand.

In referring to iron and steel, it is stated that the latter end of 1914 found the market decidedly short of supplies, and Shanghai prices reached a very high point, bringing handsome profits to those who held stocks. New contracts made since August have mostly been for American material, the prices quoted by works in the United States being far below British quotations. This of course is only natural in view of war conditions in the United Kingdom, and there seems no prospect of British works being able to compete until some time after hostilities are at an end. It would be an advantage if some British works would place stocks in the hands of reliable representatives—especially in the case of mild steel bars for reinforced concrete work, for which there is a constant and growing demand.

"The importation of machinery and the installation of electric lighting apparatus in China is worthy of the closest study by British firms who are interested in the machinery market. China shows a vigorous and increasing demand for electricity in all its branches. The Shanghai Municipal Electricity Works supplied over 40,000,000 units during 1914, as compared with 21,000,000 units in the previous year; 1,500 radiators have been installed in Chinese houses, and small motors are very popular. The installation of plant in the interior requires special measures and cannot be attempted without efficient local representation. The business was largely in the hands of German firms, mainly because they were willing to undertake entire contracts and to finance them. British firms, however, have realised the possibilities of the market, and those who have been sufficiently enterprising to meet the local conditions are being amply repaid for their trouble, whilst their work has given the greatest possible satisfaction to the Chinese companies on whose behalf the contracts have been undertaken. British installations have recently been completed for the great cities of Soochow, Changchow and Yangchow in the pro-province of Kiangsu, and for Ningpo in the province of Chekiang, whilst a very large number of smaller plants and dynamos have been supplied for lighting small towns, missions and factories."

MADEIRA.—H.M. Consul (Captain James Boyle) in his report for 1914 says:—"Importations direct from Germany were, of course, immediately suspended, but as Dutch steamers from Rotterdam have always called here regularly, it is likely that some German goods arrived by that route. The United States are very much alive to the opportunities now offered by the war for introducing their goods into Portugal and Madeira. Trade journals and catalogues are being freely sent to merchants and shopkeepers in Madeira, and are printed in Portuguese, very well drawn up and profusely illustrated, and are certainly well fitted to tempt purchasers to make a trial of American goods to replace those usually imported from Germany. The present high rate of exchange handicaps the importer considerably, whilst the factories in Portugal, started and built up under the protection of the very high Customs tariff, are able to produce and sell low class goods at a lower rate than it is possible to import them from abroad. British groceries and provisions will always be preferred here, despite the heavy duties on them."

Electric light fittings and appliances, which have been coming from Germany mostly for the last few years, would, if offered at low prices, command a ready sale.

If British manufacturers would make a study of the conditions of the market a most profitable business would arise, and business between Madeira and the United Kingdom would increase considerably.

Motor Lorry Accident.—On Wednesday last week a large motor lorry loaded with about four tons of copper met with an accident, mounting the pavement and completely wrecking part of the front of the premises of Messrs. E. P. Allam & Co., 107 and 109, Gray's Inn Road, London, W.C. Besides breaking the plate glass, it broke the whole of the pavement lights and damaged the basement hoist.

Dissolutions and Liquidations.—Venner's Electrical Cooking and Heating Appliances, Ltd.—A meeting of creditors is called for Tuesday, October 26th, at 85, London Wall, London, E.C., to consider the question of appointing a joint liquidator.

Jones & Horsfield, boiler and pipe coverers, &c., Broomstair Works, Danton.—Messrs. E. Jones and D. Hague have dissolved partnership. Mr. Jones attends to debts and continues the business under the same style.

For Sale.—Messrs. John Jackson & Co., of Glasgow, have for disposal eight generating sets and condensing plant, ranging from 800 to 125-kw., which can be seen in London. A number of steam and water valves are to be sold by the Borough Electrical Engineer, Tunbridge Wells. Particulars are given in our advertisement pages to-day.

Catalogues and Lists.—Lamp makers have not been behindhand in assisting us all to shade our lamps in these days of lighting restrictions and air raids. The latest shade received is one which can shade one side of the lamp only, and it allows the advice "Use 'Z' lamps" to stand out neatly in letters of light, with a Union Jack and the words "British made" in a circle of light, below it. Copies can be obtained from the Z Electric Lamp Manufacturing Co., Ltd.

The Edison & Swan United Electric Light Co., Ltd, Ponders End.—Illustrated leaflet, No. L 3,117, giving a few particulars and prices of Royal Ediswan radiator lamps; also an enclosure card with particulars of house service and motor panel boards.

Messrs. Holophane, Ltd., 12, Carteret Street, S.W.—"Holophane Scientific Illumination" is the title of a handbook recently issued by Messrs. Holophane, Ltd., containing a series of reproductions of photographs of actual lighting installations carried out on the Holophane system of illumination. A preface points out the supreme importance of the proper shading of light sources, and the necessity of using scientifically-designed appliances for this purpose. The Holophane glassware, which is made in England, fulfils this requirement, and is backed up by the expert knowledge of the staff and abundant engineering data, which are at the disposal of their clients. The present handbook comes within the latter category; it is divided into sections illustrating effectively various typical classes of interiors, such as churches, municipal buildings, commercial offices, clubs, restaurants, libraries, railway stations, shops—a remarkable collection indeed, showing that the Holophane system of illumination is capable of being adapted to any class of building or style of architecture. The book is one which electrical contractors and architects will find very useful for reference purposes, as well as highly instructive.

Inquiries from Lyons for British Accessories.—H.M. Consul at Lyons says that a local agent wishes to represent a British manufacturer of electrical apparatus. Also that a dealer in electrical lighting accessories of all kinds, who cannot satisfy orders owing to shortage of local supplies, wishes to get into communication with British firms making such accessories. The names, &c., of the inquirers can be ascertained at the B. of T. Commercial Intelligence Branch in London.

Trade Fair Abandoned.—The Birmingham Trades Fair arranged for the spring of 1916 will not be held, the B. of T. being of opinion that the metal trade will be too busy with war orders for manufacturers to give it attention.—*Times.*

Trade Announcements.—The business of Messrs. T. G. Poole & Co., of 16, John Dalton Street, Manchester, has been purchased as a going concern by Mr. D. C. Bate, of 40, Brazennose Street, Manchester, and it will be continued as usual under the personal supervision of Mr. Poole, whose services have been retained. Mr. Bate's original business in connection with the supply of motors, starters, &c., will not be in any way interfered with.

Messrs. Feld Bros. & Co., Ltd., announce that their head office and new works are now at 326, Goswell Road, London, E.C.

From Monday next the offices of the Western Union Telegraph Co. will be removed from 26, Old Broad Street and Broad Street House, E.C., to its new premises at Western Union House, 22, Great Winchester Street, E.C.

Bankruptcy Proceedings.—A. F. Hawdon, electrical engineer, Gosforth.—November 6th is the last day for the receipt of proofs for dividend by the Trustee; C. Woollett, Official Receiver, 30, Mosley Street, Newcastle-on-Tyne.

Book Notice.—"The Post Office Electrical Engineers' Journal." Vol. VIII. Part 3. October, 1915. London: H. Alabaster, Gatehouse & Co. Price 1s. net.

Roller Bearings.—The Hyatt roller-bearing department of Messrs. Broom & Wade, Ltd., has recently completed delivery to Messrs. Vickers, Ltd., for 500 3-in. diameter Hyatt roller-bearings for the line shafting in a new works which is entirely equipped with same. Other recent orders include some 50 2½-in. and 3-in. for Sir W. G. Armstrong, Whitworth & Co., of Elswick, 40 3-in. and 3½-in. for Messrs. Dunsmuir & Jackson, of Govan, and 75 3½-in. for the North British Diesel Engine Works, of Govan.

LIGHTING AND POWER NOTES.

Aberystwyth.—Street Lighting.—The T.C. has accepted an offer from the Chiswick Electricity Supply Corporation, Ltd., to light one pilot lamp only on each post from 30 minutes after sunset to 30 minutes before sunrise, at £2 5s. per lamp per annum.

Ayr.—Annual Report.—Mr. Roland Marshall, the burgh electrical engineer, in his report, states that in spite of a reduction of 21·9 per cent. in the number of units sold for lighting purposes there was, during the past financial year, an increase of 3·6 per cent. in the total number of units sold for all purposes, due principally to the large increase of 57 per cent. in the number of units sold for power. There was a total reduction of 82,822 in the number of units sold for private and public lighting purposes, which was due to the restricted lighting. The revenue showed a decrease of £448 for the year. There was a net surplus for the year of £1,248, which had been placed to the credit of the reserve fund, which now amounts to £5,351. The amount expended on coal showed a decrease of £513, a result due to the use of very low-grade fuel, made possible by new stoking apparatus installed last year.

Barnsley.—Works Extensions.—The Electricity and Lighting Committee, with the consent of the Council, has appointed Messrs. Crawshaw & Wilkinson, the architects for the extensions to the electricity works, at a commission of 4 per cent.

Barnes.—Coal Supply.—Tenders for a six months' supply of coal having been received, the Lighting Committee consider that none of the prices quoted are sufficiently attractive to warrant its recommending the Council to enter into a contract. The engineer has been instructed to purchase supplies in the open market, to obtain a supply sufficient for four weeks for storage purposes.

Barrow.—We understand from Mr. H. R. Burnett, chief electrical engineer, that our statement last week that his Electricity Committee was recommending an increase in the price of electricity, is incorrect. Mr. Burnett adds that this question is unlikely to be considered at Barrow, as owing to the abnormal increase in output the working costs, despite a large increase in the price of coal and labour, have been largely reduced. He adds that during the quarter ended June 30th nearly 2,000,000 more units were sold than during the corresponding period of last year, and it is probable that a similar, or greater, increase will be recorded during the remaining quarter of this financial year.

Year's Working.—The report of Mr. Burnett, the borough electrical engineer, on the last financial year's working of the electricity department, shows that, owing to the great demand of local industries, the output sold reached 3,597,410 units, as compared with 2,081,317 units in the previous year, the power units representing 56 per cent. of total as against 34 per cent. in 1913-14. The maximum load reached 2,285 kw., and the load factor remained nearly stationary at about 18 per cent. Owing to the favourable load conditions and despite increased charges, the works costs fell from ·98d. to ·69d. per unit, and the total cost from 1·32d. to ·92d. per unit—a reduction of 30 per cent. Briefly, the undertaking yielded a revenue increase from £20,149 in 1914 to £26,585 in 1915; a gross profit increase from £8,689 to £12,717, and a net profit increase from £513 to £3,163—the result being £2,650 in excess of the previous year's result, and a record. During the year a 2,000-kw. 3,000 r.p.m. B.T.H. turbine set, with switchgear by the same firm, was installed, also a 30,000-lb. Stirling boiler with underfeed stokers, and other work carried out in connection with cooling towers, feed pumps, economisers, &c. Mains and sub-station extensions have also been undertaken, including the installation of three 500-kw. rotary converters. A number of street arc lamps have been replaced by 500 and 300-watt half-watt lamps. At March last 345 motors of 2,412 h.p. were connected to the supply, while the electric heating and cooking apparatus on hire totals 605, an increase of 193 apparatus in the year. The total includes 43 ovens and 321 electric irons. Mr. Burnett stated that a further phenomenally large increase in output during the current year is assured, and that owing to this and the modern plant in use, a further reduction in generating costs is anticipated.

Bidford-on-Avon.—E.L. Scheme.—A parish meeting was held last week to consider an E.L. scheme for the parish, proposed by Mr. Best, of Bradford, under which it is intended to form a local company to carry out the project, and to supply current for lighting at 6d. per unit, and for cooking or power at 3d. A resolution was passed in favour of the scheme, and requesting the Alcester R.D.C. to give the promoters reasonable encouragement in their endeavours to carry the same into effect.

Bo'ness.—Plant Extension.—The T.C. has approved of the proposals of the National Electric Construction Co. to install temporarily two 100-kw. Diesel oil engines. It is also proposed to make temporary extensions to the power house, and the cost is estimated at £7,000. The extensions are necessary by reason of a contract which has been entered into by the company with a new consumer.

Bungay.—E.L. Scheme.—Mr. C. H. Best, of Bradford, has approached the U.D.C. with reference to an E.L. scheme for the district, and is seeking the attitude of the Council towards the project. The Council has decided to obtain further information from Mr. Best.

Chesterfield.—Loan Sanction.—The T.C. has received sanction to a loan of £5,000 for additional plant at the electricity works. On account of reduced street lighting, the Electrical Energy Committee has allowed a rebate of £150 per annum on the cost.

Continental Notes.—Russia.—The Pereyaslavl T.C., in the Government of Poltava, is considering whether to construct an electric lighting system, or to buy up the existing private one; a Committee has been appointed to advise on the subject.

The Smolensk T.C. has decided to buy up the local tramway and electric systems, for which purpose 500,000 roubles have been allocated.

The Kieff Town Council has decided to give electricity free to hospitals and analogous institutions from the plant which it has just sequestrated.

It is proposed to extend the electric station of Tiflis. The capacity of the present plant is 900 h.p. The recommendation is

to install two Diesel motors, each of 600 H.P., at a cost of 200,000 roubles.

At Astrachan, in view of the impossibility of obtaining carbons for street lighting, it is proposed that the Town Committee shall adopt other lamps.

Spain.—A feature of the electric power transmission line which is at present being established between Penarroya and La Carolina, a distance of about 90 miles, in order to connect the power station of the Compania Mengemor with the works of the Sociedad Minera y Metalurgica de Penarroya, is that the masts carrying the line are being constructed of armoured cement. The masts, which range from 36 to 50 ft. in height, are being made in accordance with the Aligerad system of the Compania Constructora de Postes de Cementos Armado, of Madrid.

Dover.—Cottage Lighting.—A report on the lighting of 12 cottages at the pier, presented to the Corporation Electricity Committee, shows that the receipts, after deducting the cost of lamps, was 4·66d. per unit, a better result than was anticipated. The engineer recommends the further development of the system. A request to reduce the cost of current supplied to the Lord Warden Hotel has been refused.

Eston.—E.L. Petition.—The U.D.C. has received a petition from 162 ratepayers asking that steps be taken for procuring a supply of electricity from local purveyors. The Council has informed the petitioners that it is powerless to deal with the matter, and intimated that those requiring electricity for lighting and heating should communicate directly with the firms supplying it in the district.

Glasgow.—Hospital Lighting.—Some time ago the Health Committee accepted the offer of the Clyde Valley Electrical Power Co. to supply electricity for the proposed hospital at Robroyston at the rate of 1½d. per unit, with a guaranteed annual bill of £150 for five years, on condition that the T.C. erected a small transformer house and paid the cost, amounting to £750, of erecting the overhead wires. Subsequently the company offered in lieu to run an underground cable, subject to a guaranteed annual consumption equal to £300, with an adjustment depending on coal prices, and the latter offer was accepted.

Gravesend.—Mains Extension.—The T.C. has decided to lay an additional cable to supply Messrs. Henley, who need practically double their present amount of current. Messrs. Henley will bear the capital cost of the cable and maintain it, and the Council will allow an annual rebate of £80, the equivalent of the charge required to liquidate the capital outlay over the period of the life of the cable.

Heywood.—Bulk Supply.—The T.C. has been informed that it was anticipated that the work in connection with the bulk supply of electricity would be completed in a fortnight's time. After then the Council would be in a position to receive the whole of its supply from Bury.

Holywell.—Laundry Plant.—The L.G.B. has informed the B. of G. that it cannot approve of the proposal to install electric plant for the workhouse laundry, not being satisfied that the economy effected by the installation would cancel the cost within a reasonable period. The B. of G. has referred the matter back to the House Committee for further consideration, it being considered that by the installation, sufficient would be saved to cover the outlay in three years.

Ilkley.—E.L. Loans.—Following a minute of the D.C. to the effect that it was in negotiation with the L.G.B. for sanction to a loan for extensions of cable services, the clerk to the Council has made a detailed statement on the financial position of the electricity scheme generally. The estimated cost of the undertaking, it is stated, was £18,000, and the L.G.B. had sanctioned the borrowing of that sum. The actual payments to date amounted to about £14,000, but the engineer estimated that £20,500 was required to complete the scheme. This estimate could now be regarded as fairly definite, as the scheme was nearing completion. The new minute was to secure the raising of a loan for the extra £2,500; and though the L.G.B. had intimated that loans could not be sanctioned, the Council is asking that it may be allowed to spend not more than this sum to complete the works, and that formal application for borrowing powers be deferred until the end of the war; the Board is also asked to favourably consider the matter then. The number of consumers is, so far, disappointing, though twice the number promised to take a supply of electricity. It is calculated that the town must expect a loss of £2,000 on the undertaking next year, equivalent to an 8d. rate.

Kilrea (Co. Derry).—At a meeting of the Derry County Council, a deputation of the people of Kilrea requested that the poles and electric wires used by Mr. W. B. Bolton in the electric lighting of the town be removed, and that permission be granted to Mr. Robert Peden to erect the necessary poles and wires and plant for lighting the town. It was alleged that Mr. Bolton supplied the current only when he thought fit, and that a large number of the consumers had notified that they would not take any further supply from him, so unsatisfactory were the conditions. On behalf of Mr. Bolton it was stated that he had sunk what capital he had in the plant and fittings, which had cost him £600. The whole income was £102 per annum, and it was insufficient, the townspeople not supporting him. The Council adjourned the matter pending a report by its surveyor.

Leigh.—Electrical Showroom.—The Chairman and deputy-chairman of the Electrical Committee hold the view that for the present it is not desirable to open a showroom of electrical fittings, but at a meeting of the T.C. last week several members expressed disappointment that the matter had been shelved, and an amendment was carried that the matter should be referred back for further consideration.

London.—Bermondsey.—Regarding the recent alleged smoke nuisance at the generating station, the Electricity Committee explains that the work of substituting chain grate stokers for the three underfeed stokers is, owing to war conditions, progressing very slowly, and that immediately the stokers are installed it will be able to reduce the smoke to a minimum.

Manchester.—A letter of protest against the Barton power station scheme has been addressed to the L.G.B. by Mr. P. Percival, secretary of the Manchester Ratepayers' Association, who states that, having secured extensive borrowing powers on the strength of helping in the production of munitions, the Electricity Committee is now letting it be known that it is not intended to provide more than an empty shell, instead of a large new station, during the continuance of the war.

Newport (Mon.).—The L.G.B. has sanctioned the raising of £8,327 by the T.C. for a refuse destructor. The Committee has deferred for the present the request of the Electric Vehicle Committee that the Council should contribute an annual subscription. The borough electrical engineer has reported that, owing to the shortage of staff in the distributing department, he proposed to transfer an engineer-in-charge from the works to that department, and to fill the vacancy thus created by the appointment of another assistant.

Penang.—George Town Electricity Department.—The report of Mr. O. V. Thomas, the manager, on the 10th year of working (1914) of the municipal electrical undertaking, shows that 1,460,413 units were sold, as compared with 1,291,061 units in the previous year. The revenue amounted to $281,595.5, an increase of about 9 per cent.; the gross profit was $154,804 (17 per cent. on average capital expenditure), and out of this, interest, sinking fund, depreciation, renewals and reserve contributions amounting to $96,912, or 10 per cent. on the capital, were made. The generating station is now equipped with two Hornsby and four Babcock boilers, two 100-KW. and two 300-KW. Allen-Westinghouse and two 500-KW. Browett, Lindley-E.C.C. high-speed steam generating sets with ejector condensers, the cooling water being pumped from a settling pond supplied by gravity from a tidal river. One sub-station is equipped with a balancer-booster and Tudor battery, while the other contains a balancer set for the lighting circuits, and a motor-generator for supplying the tramways from the lighting bus-bars. The distributing network is on the three-wire system, at 460 and 230 volts. At the end of the year 1,919 consumers were connected, with an aggregate demand of 68,467 30-watt lamps, including 1,676 fans. The total costs amounted to 8·68 cents per unit sold, and the works costs to 7·24 cents. On the mains 21 faults occurred, 15 in paper-insulated vulcanised-bitumen sheathed cables, two in rubber-insulated connections in pillars, and four in paper lead-sheathed cables—the latter being due to mechanical damage and subsidence. It is interesting to note that the department has felt the effects of the war in the matter of rising prices and difficulty in obtaining materials.

Portstewart.—At the meeting of the Derry County Council, it was suggested that the petrol lamps at Portstewart Harbour should be replaced by electric lamps. The surveyor was directed to obtain an estimate of the cost.

Sligo.—Asylum Lighting.—Mr. A. Scott, architect, reporting to the District Asylum Committee on the lighting of the institution, stated that he had tried to get an electrical firm that would undertake the work, but had failed. Several members said the gas was unsatisfactory, and it was agreed that Mr. Scott should be asked to go further into the matter.

South Africa.—The applications for subscription to the recent loan of £75,000 for the Corporation Town Municipal electricity extensions amounted to £205,830.

Stroud (Glos.).—E.L. Scheme. — The U.D.C. has approved of a plan of proposed works under the E.L. order, submitted by Messrs. Edwards & Armstrong, Ltd., subject to terms submitted to the firm.

Swindon.—Overhead Lines.—The T.C. has applied to the B. of T. for consent to use overhead lines to the factory of Messrs. Gundry, Newcastle Street, for the transmission of current, at a pressure of 440 volts.

West Bromwich.—The T.C., owing to the demand for current for power, has decided to discontinue connecting private houses for lighting purposes. The Electricity Committee has been authorised to negotiate and enter into a contract for the supply of power in bulk, and to put down the necessary converting plant.

Worcester.—Price Increase.—In order to meet the increased cost of coal, the T.C. has decided to increase the price of current to private consumers for lighting, power and heat by 10 per cent.

Windsor.—Street Lighting.—The T.C. has decided, in agreement with the Electrical Installation Co., to suspend the existing public lighting contract from September 17th last on the following conditions:—That the company replaces existing high C.P. lamps by others of a new type, the annual charge to be reduced from £434 to £314, and the contract to run for four years on the old conditions when normal lighting conditions are resumed.

TRAMWAY and RAILWAY NOTES.

Blackpool. — Contract Tickets. — The Tramways Committee has decided to recommend that tramway passengers' contract tickets be increased from £3 to £4 per annum. According to a report prepared by Mr. C. Furness, the tramway manager, the number of contracts issued has increased from 922 in 1911 to 1,466 in 1915, and the revenue from this source from £2,516 in 1911 to £4,146 in 1915. Twenty per cent. of the passengers were contract holders, and their average fare worked out at a fraction above ½d., as against an average fare of 1½d. received from each paying passenger. The average working expenses per passenger were slightly over ¾d., and the contract system meant a loss to the department of something like £2,000. Mr. Furness suggested sectional contract tickets at £4 per annum, and combined contract tickets covering all routes, at £6 per annum. The Tramways Committee considered that sectional contracts would be somewhat complicated, and decided to recommend that the whole system should be continued, the price of contracts, however, being raised from £3 to £4 per annum. If the T.C. approves, the higher charge will come into force on November 1st.

From April 1st to October 7th the tramway receipts were £1,040 more than during the corresponding period of last year, and the decrease of £8,800 recorded at the end of July by comparison with the corresponding period of 1914 has, of course, been entirely wiped out.

Continental.—Italy.—Messrs. Aroedi Grippa e Ca., engineers, of Milan, have submitted a scheme to the Italian Ministry of Public Works for the electrification of the secondary and complementary railways of Sicily. The scheme has been drafted by the Engineer Chauffourier. The network proposed to be electrified comprises 11 secondary lines, with two branches, serving 25 cities and towns; and 7 complementary lines, with two branches, serving 28 cities and towns. The estimated present coal consumption on this network is 70,000 tons, of a value of £140,000, on which a saving of £40,000 would be effected were this network electrically worked. Owing to the extent of the network, the scheme advocates the adoption of single-phase working at 11,000 volts. The distribution is to be made from a transformer and conversion station at Nicosta, which will be supplied from the central station of the Società Elettrica della Sicilia Orientale. This supply will be distributed at 50,000 volts to 14 sub-stations, where it is to be stepped down to 11,000 volts. The distribution network will be supported on iron standards. The modest working margin (£24,000) which the financial side of this large scheme shows hardly justifies its realisation, says *L'Elettrotecnica*.

Dewsbury.—Tramway Accident.—A runaway tramcar practically demolished a boot shop and a considerable portion of the Scarborough Hotel, in the Market Place, last week. Through some cause unknown, control was lost of an Earlsheaton car coming into the Market Place down the Wakefield Road, which at that place is very steep. On previous occasions when cars have overrun the points, they have always been brought to a standstill on the setts. On this occasion the car ran down the hill at a great speed, crossed the setts and crashed into the building. The shop under the hotel was ruined, the wall collapsing and the car being embedded to a depth of 2 or 3 ft. The upper part of the building collapsed later in the day. Seven persons were injured, but, fortunately, all are reported to be making satisfactory progress towards recovery. The lady conductor was injured in jumping off the runaway car.

L. & S.W. Electrification.—It is announced that the first electric section of the South-Western Railway, between Waterloo, Putney, and Wimbledon will be opened for service on Monday next. A 20-minutes' service will be given, the journey occupying 24 minutes, as compared with 30 minutes required by the steam trains.

Leeds.—Female Labour.—The Tramways Committee has given authority to the general manager (Mr. J. B. Hamilton) to arrange for the employment of women as tramcar conductors. The step has been rendered necessary by the increasing shortage of male labour and a resultant curtailment of services. Where possible, preference will still be given to men who are ineligible for military service. The women will be paid 5d. per hour, the same amount as is paid to the men on this work, and their week is expected to be one of 60 hours, making their wage 27s. 6d. There have been several hundred applications for the work. It is expected, also, that women will be employed as car cleaners.

London. — Female Conductors.—The Metropolitan Police authorities have now announced their willingness to issue licences to suitable women to act as conductors of omnibuses and tramway cars, thus enabling the London tramways to fall into line with the large provincial undertakings.

Manchester.—Half-Yearly Report.—The working of the Corporation tramways undertaking up to September 30th resulted in a total revenue of £480,692, compared with £467,681 and £470,754 for the corresponding periods of 1914 and 1913 respectively. The working expenses were £278,106, compared with £295,448 and £287,449 in 1914 and 1913 respectively. To the working expenses for the half-year, however, there had to be added £45,522, in respect of war service allowances to men and dependents of men serving at the Front, and, in addition, there was £78,585 for interest, sinking fund, &c., bringing the total expenditure to £402 213, compared with £372,351 and £358,778 for the same periods of 1914 and 1913. The surplus was £78,479, as against £95,330 in September, 1914, and £111,976 in September, 1913. The number of car-miles run was 9,435,921, compared with 9,972,567 and 9,769,574 in the corresponding periods of 1914 and 1913, but the revenue per car-mile was 12·023d, compared with 11·076d. in 1914. The general revenue was 12·224d., as against 11 252d. a year ago, and the expenses per car-mile were 7·073d., as against 7·109d. in the corresponding period of last year. It was stated at the meeting that of £23,500 raised for relief funds on the tramway systems of the country, Manchester had contributed £14,000.

Penang.—George Town Tramways. — During the ninth year of operation, the municipal tramways carried some 5,600,000 passengers, as against the 4,900,000 in the previous year; 504,000 car-miles were run on the system which covers 11½ single track miles. The total revenue amounted to $153,014 and the operating costs to $92 616 or 18 38 cents per car-mile.

Perth.—Mr. W. G. Snell, Corporation Tramways manager, reports that for the past four weeks 162,918 passengers were carried on the cars, giving receipts amounting to £799, an increase over the same period last year of over £100.

Rochdale.—War Wages.—Following the second refusal of the Tramways Committee to make a permanent advance of wages to tramway men in lieu of a bonus, the workmen's Trade Union has asked that the matter should be referred to the B. of T. for arbitration. The Tramways Committee has asked representatives of the Union to meet it this week on the matter.

South Lancs.—Collision.—Two cars on the South Lancashire Co.'s tramway system, between Walkden and Little Hulton came into collision on Monday morning. The cars were travelling on a single line and a dense fog prevailed. Both drivers escaped injury, as did also the few passengers who were on the cars at the time.

TELEGRAPH and TELEPHONE NOTES.

Revision of Tariffs.—In the House of Commons last week, the Postmaster-General stated that the increase in the charge for ordinary 12-word telegrams from 6d. to 9d. had been accepted by the country without protest. Short-distance telegrams, which were remunerative, had been largely replaced by telephone messages, whilst long-distance telegrams, which did not pay, had increased in number. Nevertheless, the cost of telegrams on the average was slightly under 8d. each, compared with 8d. in 1885. The total loss on the telegraph service was £1,200,000 a year. The Press had objected to the proposed increases in the rate for Press telegrams, and these had been revised, and would not come into force until the end of next year. The present cost of Press telegrams by day was 1s. per 75 words for the first copy and 2d. for each additional copy, and as nine-tenths of the telegrams were sent at the copy rate, the average receipts for Press telegrams were only 3d. per 100 words by day and 4d. by night. Sixty per cent. of the Press telegrams were sent at the day rate, and only 64 per cent. of them were published. The additional revenue expected from ordinary telegrams was £410,000, and from Press telegrams £60,000. The Post Office expected also to effect a saving of £70,000 a year owing to the reduced traffic, and hoped to increase the saving to £200,000. Eventually, the improvement in revenue and reduced expenditure should amount to about £740,000. In future the Press rate will be 1s. per 60 words by day and 80 words by night, and 3d. per additional copy.

Cable Repair.—The submarine cable which connects Mull, Coll, and Tiree with the mainland, and which was interrupted on August 23rd, has been repaired, and communication now goes on by the usual channels. During the six weeks of interruption the wireless stations on the West Coast maintained communication.

Australia.—It has been decided by the Federal Government to transfer the wireless branch of the Postmaster-General's Department to the control of the Minister of the Navy.

Wireless Telephony.—We understand that the successful experiments which resulted in telephonic communication without wires between Arlington and San Francisco were carried out jointly by the American Telephone and Telegraph Co. and the Western Electric Co., in co-operation with radio stations under the jurisdiction of the U.S.A. Navy Department.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—December 7th. P.M.G.'s Department (various States). Non-encrusting zincs, carbon and manganese powder, manganese chloride, chloride of ammonia, porous pots (2 in.), outer jars for cells, carbon blocks, resistance boxes of 5,000 ohms, &c. See "Official Notices" October 15th.

SYDNEY.—December 6th. Municipal Council. 33,000-volt outdoor transformers and switchgear. Specifications (10s. 6d.) from Electric Light Department, Town Hall.

December 20th. Metropolitan Board of Water Supply and Sewerage. Centrifugal pumps and electric motors at the Marrickville low-level pumping station.

November 4th.—P.M.G. 58 miles lead-covered cable (11 items).

January 12th, 1916. N.S.W. Railway and Tramway Department. Two water-tube boilers, &c., for the Zara Street power house, Newcastle. See issue of October 8th for further particulars.

January 31st, 1916. Three electrically-operated railway freight-car transferers, for Jones Bay wharfage, Pyrmont. Particulars from Engineer-in-Chief of the Harbour Trust, Circular Quay.

MELBOURNE.—December 14th. Deputy P.M.G. Eleven sections of a lamp-signalling trunk-line switchboard, and other material necessary for increasing the equipment of Melbourne trunk exchange from 108 to 240 lines. Schedule 1,207.*

December 14th. P.M.G. For delivery in all States, 18,670 common-battery wall pattern telephones, manufactured in Australia. Sched. No. 1.264.

January 5th, 1916. Installation of automatic sprinklers and thermostats at Jolimont car-shed. Chief Storekeeper, Railway Offices, Spencer Street, Melbourne.

PERTH.—December 8th. 294 accumulators, and power board complete, for P.M.G.'s Dept. See "Official Notices" October 8th.

Bradford.—November 13th. Corporation. Twelve months' supply of lamp fittings, insulating material and tramway stores for the Tramways Committee. Specifications from the Tramway Offices, 7, Hall Ings.

Cape Town.—November 5th. Corporation. One 4,000-K.V.A. (or alternatively smaller or larger, according to whichever can be delivered earliest) steam-turbine-driven alternator; also one 1,000-KW. converting plant. Specifications, &c., from Messrs. Davis & Soper, 54, St. Mary Axe, E.C.*

Dublin.—October 25th. Corporation. Alterations and additions to electric lighting of public baths and wash-houses, Tara Street. Specifications from the City Electrical Engineer, Fleet St.

November 4th. Great Northern Railway Co. (Ireland). Twelve months' supply of stores, including a number of electrical items. See "Official Notices" October 15th.

Glasgow.—The chief electrical engineer has been authorised by the T.C. Electricity Committee to order transformers and switchgear to put down in munition works, at an estimated cost of £1,777.

Grimsby.—November 4th. Corporation. House service boxes (lead), and fittings; house fuse boxes and fittings. See "Official Notices" to-day.

Lanark.—November 1st. The District Committee of the Middle Ward of the County of Lanark invites tenders for executing the electric lighting works at Hairmyres Colony, East Kilbride. Schedules from the consulting engineer, Mr. William Arnot, 163, Hope Street, Glasgow.

London.—November 3rd. L.C.C. Installation of 193 wiring points, 240 lights, at Thornfield Road Elementary School, Coverdale Road, Hammersmith, W. See "Official Notices" to-day.

HAMMERSMITH.—October 26th. Borough Council. Supply of 150 tons per week of through and through free-burning Welsh steam coal for the hand-fired boilers at the electricity station. Mr. G. G. Bell, Borough Electrical Engineer, Electricity Works.

Manchester.—October 27th. (*a*) Coal conveying plant, new coal hopper, &c.; (*b*) water cooler; (*c*) two electrically-driven circulating water pumps; (*d*) turbine-driven boiler feed pump for the Electricity Department. Specifications, &c. (£1 1s.), from Mr. F. E. Hughes, Secretary, Electricity Department, Town Hall.

New Zealand.—DUNEDIN.—November 3rd. City Council. Insulated and bare copper wire for a period of two years.*

November 3rd. City Council. One 3,000-volt regulator.*

Spain.—November 15th. The municipal authorities of Noblejas (Province of Toledo) are inviting tenders for the concession for the electric lighting of the town during a period of five years.

York.—October 28th. N.E. Railway. Six or twelve months' supply of telegraphic apparatus, wire, and line stores. See "Official Notices" October 15th.

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Branch in London.

CLOSED.

Cape Town.—For the supply of low-tension feeder cable, joint boxes and disconnecting pillars for the Corporation electric lighting department, six tenders were received. The three lowest are as follows:—

Siemens, Ltd.—Cable, £4,324; straight through boxes, £36; end boxes, £39; total £4,399.
S.A. General Electric Co.—Cable, £4,674; straight through boxes, £74; end boxes, £62; total £4,810.
Telegraph Manufacturing Co.—Cable, £4,780; straight through boxes, £58; end boxes, £40; total £4,878.

In order to make Messrs. Siemens's tender comparable with the other tenders received, it was necessary to add a figure to allow for the rise in both copper and lead, and also a figure for increased freight and insurance. These figures brought the total tender to £4,667, which was finally accepted. With regard to two disconnecting pillars, the only tender received was that of Messrs. Siemens, Ltd, for £172, and that also was accepted.

Colchester.—The T.C. has accepted the tender of Messrs. Mellonie & Goulder, Ltd., for 250 tons of Cresswell screened nut coal for the electricity works, at £1 4s. 6d. per ton.

Glasgow.—The Tramways Works and Stores Committee has recommended acceptance of the following:—

Special trackwork.—Edgar Allen & Co., Ltd.
Switchboard for head office.—Mavor & Coulson, Ltd.
Electric heaters for Govan depôt.—Archd. Watson & Co.; Crompton and Co., Ltd.
Woodworking machine irons.—C. D. Monninger, Ltd.

Government Contracts.—List of new contracts for September, 1915:—

WAR OFFICE.

Distribution boards.—Cable Accessories Co., Ltd.; Cranmer & Cheshire; Dorman & Smith; E.M.F. (1914), Ltd.; Forward Electric Co., Ltd.; Galsworthy, Ltd.; General Electric Co., Ltd.; D. Hulett & Co., Ltd.; Ingram & Kemp, Ltd.; Kartret Engineering Co.; Rainsford & Lynes; Sun Electrical Co., Ltd.; W. Whitehouse & Co, Ltd.
Electric cables and wire.—B.I. & Helsby Cables, Ltd.; Craigpark Electric Cable Co., Ltd.; J. Frankenburg & Sons, Ltd.; A. Green, Ltd.; I.-R., G.-P. & Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Liverpool Electric Cable Co., Ltd.; St. Helens Cable & Rubber Co., Ltd.; Saxonia Electrical Wire Co., Ltd.; H. W. Smith & Co., Ltd; Ward and Goldstone; Yorkshire Cable Co., Ltd.
Electric cells and parts.—J. C. Fuller & Sons, Ltd.; Siemens Bros. and Co., Ltd.
Electric lamps.—Bulpitt & Sons, Ltd.; Edison & Swan U.E.L. Co., Ltd.; E. Griffith & Sons, Ltd.; A. Lyon & Wrench, Ltd.
Lamps and lanterns.—C. Collins, Ltd.; General Electric Co., Ltd.; J. Hinks & Sons, Ltd.; Jones & Foster, Ltd.; Kitson Empire Lighting Co.; Lyon & Wrench, Ltd.; G. Polkey, Ltd.; Pope's Electric Lamp Co., Ltd.; Rippingill's Albion Lamp Co., Ltd.; Sherwoods, Ltd.
Electric lighting.—H.M. Gun Wharf, Devonport: W. G. Heath & Co.

INDIA OFFICE.

Cells.—Chloride Electrical Storage Co.
Core.—Siemens Bros. & Co., Ltd.
Insulator cups.—Bullers, Ltd.
Switchboard.—Peel-Conner Telephone Works, Ltd.
Wire.—Shropshire Iron Co., Ltd.
Wireless telegraph apparatus.—Marconi's Wireless Telegraph Co.

H.M. OFFICE OF WORKS.

Incandescent electric lamp supply to August 31st, 1916.—British Thomson-Houston Co., Ltd.; Dick, Kerr & Co., Ltd.; Pope's Electric Lamp Co., Ltd.; The "Z" Electric Lamp Mfg. Co., Ltd.; Foster Engineering Co., Ltd.

POST OFFICE.

Protective apparatus.—Walters Electrical Mfg Co., Ltd.
Telephone apparatus.—British L. M. Ericsson Mfg. Co, Ltd.; Peel-Conner Telephone Works, Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Submarine cable.—Eastern Telegraph Co., Ltd.; I.-R., G.-P. & Telegraph Works Co., Ltd.; Telegraph Construction & Maintenance Co., Ltd.; Union Cable Co.
Battery cells.—Siemens Bros. & Co., Ltd.
Chloride of ammonia.—Brunner, Mond & Co.
Telephone cords.—London Electric Wire Co. & Smiths, Ltd.; Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. & Co., Ltd.
Metallic filament.—British Thomson-Houston Co., Ltd.; Edison & Swan U.E.L. Co., Ltd.; General Electric Co., Ltd.; Siemens Bros. Dynamo Works, Ltd.
Telephone lamps.—General Electric Co., Ltd.
Bronze wire.—F. Smith & Co. (incorporated in the London Electric Wire Co. & Smiths, Ltd.).

Holmfirth.—The District Council has accepted the tender of Messrs. Roy & Co. for the supply of a cooling tower and a water tank at the new electricity works

London.—METROPOLITAN WATER BOARD.—The following tenders have been accepted:—

Edison & Swan United E.L. Co., Ltd.—Fuseboards in cast-iron cases, £33.
Callender's Cable & Construction Co., Ltd.—Coils, 110 yds., taped and braided, V.I.R., 600 megohm grade, £116.
Sterling Telephone and Electric Co., Ltd.—Special stethoscope receiver cases, £83.

L.C.C.—The Council has received the following tenders for the supply of an electric lighting main in connection with the lighting of refuges on the Victoria Embankment:—

W. T. Henley's Telegraph Works Co., Ltd.	(accepted)	£114
Callender's Cable & Construction Co., Ltd.		116
B.I. & Helsby Cables, Ltd.		117
W. T. Glover & Co., Ltd.		118

The following tenders have been received by the London Education Committee for installing electric light at the Winchester Street School, Finsbury:—

Napier, Kimber, Ltd.		£110
" "	(alternative) (accepted)	404
Alpha Manufacturing Co.		146
Automobile & Electrical Equipment Co.		163
A. Hawkins & Sons		165
Tredegars, Ltd.		172
Titan Lift Co., Ltd.		181
G. Weston & Sons, Ltd.		232
T. W. Vaughan & Co. (1914), Ltd.		242

The Education Committee has received claims from Messrs. Defries & Goldman, Ltd., for additional allowances on their con-

tracts for installing electric light at four schools, owing to the increase in the price of materials between the time of the acceptance of their tenders and the commencement of the work. During the Committee's recent recess the chairman, as a matter of urgency, approved conditionally the undermentioned allowances:—Woolmore Street, Poplar, 20 per cent.; Star Lane, Fulham, 10 per cent.; Senior Street, Paddington, 10 per cent.; The "Victoria," Hammersmith, 10 per cent.

The Committee, in February, 1914, accepted the tenders of Messrs. A. Hawkins & Sons, amounting to £369, and the Alpha Manufacturing Co., amounting to £463, for installing electric light in the Ranelagh Road, St. George, Hanover Square, and Vernon Square, Finsbury, schools, respectively. Messrs. Hawkins & Sons now submit a claim for £13 10s. in respect of the increased cost of materials consequent on the war. The Committee considers the claim reasonable, as, owing to the strike in the building trade, it was not possible to give the order to commence until the following September. The Alpha Manufacturing Co. have also submitted a claim for delay under similar circumstances, and have agreed to accept the sum of £12 10s. in settlement.

Malvern.—The U.D.C. has accepted the tender of the South Wales and Cannock Chase Coal and Coke Co., for the supply of boiler slack to the electricity works for a year.

Margate.—The T.C. has accepted the tender of the Rapid Magnetting Machine Co., Ltd., at £135, for a magnetic separator for the dust destructor, comprising one electro-magnetic separator, one 10-amp. dynamo, a 1 H.P. motor and starter, and a switchboard, including fixing.

Muizenberg (Cape Province).—The following tenders were received for electric lighting and bells at a new boarding house:—

	Light.	Bells.
Clyde Engineering Works .. .. (accepted)	£229	£52
Edward A. Shaw & Co.	246	51
Cunningham & Gearing	265	72
Koch & Dixie	284	65
R. G. Jack & Son	333	62

Newport (Mon.).—The Corporation Electricity Committee has received the following tenders for the supply of converting plant:—

	kw. capacity.	
British Thomson-Houston Co., Ltd.	250	£1,123
Alternative .. .. (accepted)	264	1,173
British Electric Transformer Co., Ltd.	330 K.V.A.	297
General Electric Co., Ltd.	300	1,081
Alternative	500	1,616
Bruce Peebles	350	1,390
British Westinghouse Co.	300	1,309
Siemens Bros. Dynamo Works	275 / 300	1,255
Blackburn Corporation (second-hand plant)	250	670

The Electricity Committee has resolved to accept the alternative tender of the British Thomson-Houston Co., Ltd., together with an extra-high-tension 6,000-v. feeder panel, subject to the price being satisfactory.

The Electricity Committee has approved the action of the engineer in obtaining 100 to 120 tons of coal from Messrs. James and Emanuel at 13s. 6d. per ton, and has resolved (1) to accept the "spot" lot offered by the firm at 13s., and (2) to contract for the following coal for delivery up to August next:—

James & Emanuel.—3,500 tons of Tirpentwys, 13s. 3d. per ton.
Crumlin Valley Collieries, Ltd.—1,000 tons of Haffodyrynys, 13s. 3d. per ton.
Partridge, Jones & Co., Ltd.—2,500 tons of Mynydd Black Vein, 13s. 6d. per ton.
Bedwas Navigation Collieries Co., Ltd.—2,500 tons of Bedwas small, 15s. 4d. per ton.

It is also proposed to purchase 150 tons of Messrs. John Vipond and Co.'s "washed" small coal, at 16s. per ton, in order that the engineer may be in a position to report as to the properties of such coal.

Ramsbottom.—The U.D.C. has accepted the tender of Messrs. J. Wolstenholme & Son for a motor and pump for lifting sludge at the sewage disposal works, for £241.

Stratford-on-Avon.—The Joint Hospitals Committee has accepted the tender of Messrs. Booth & Bomford, Ltd., for the installation of internal telephones at the hospital, at £18.

Sunderland.—The T.C. has accepted the following tenders on behalf of the Electricity and Lighting Committee:

Ferranti, Ltd.—1,500-kw. E.H.T. cubicle.
Dearborn Chemical Co., Chicago.—900 lb. Dearborn Water Treatment.
Brunner, Mond & Co., Ltd.—Alkali.

Tynemouth.—The Electricity Committee has accepted the tender of the Cowpen Coal Co., Ltd., for coal.

West Bromwich.—The T.C. has accepted the tender of Messrs. R. H. Longbotham & Co., of Wakefield, for a second-hand turbo-alternator and generating plant; and that of Messrs. Field and Bradley for 3,000 tons of slack coal for the electricity works.

Worcester.—The Electricity Committee of the T.C. has accepted the following fuel contracts:—

Underwood & Co., Ltd.—1400 tons Birch Coppice best screened beans or d.s. nuts, 19s. 11d. per ton.
South Wales and Cannock Chase Coal Co.—1,920 tons of Highley seconds bright slack, 14s. 6d. per ton.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, October 22nd. At 8 p.m. At 39, Victoria Street. Paper on "Safety Precautions for Transmission Machinery," by Mr. W. V. H. Capps.
Oct. 29th. At 8 p.m. Paper on "Electric Clocks," by Mr. W. B. Prince.

Physical Society of London.—Friday, October 22nd. At 5 p.m. At Imperial College of Science, S.W. Papers.

Manchester Association of Engineers.—Saturday, October 23rd. At Grand Hotel, Aytoun Street. Paper on "Notes on Some Recent Researches," by Prof. J. E. Petavel.

Institution of Electrical Engineers (Western Local Section).—Monday, October 25th. At 5.30 p.m. At Merchant Venturers' Technical College, University of Bristol. Address by the Chairman, Mr. D. E. Roberts.
(Birmingham Local Section).—Wednesday, October 27th. At 7 p.m. At the University, Edmund Street. Chairman's address, by Col. J. F. Lister.

Post Office Telephone and Telegraph Society.—Monday, October 25th. At 6.30 p.m. At the I.E.E., Victoria Embankment, W.C. Presidential address by the Postmaster-General, followed by an address on "Telephones, Provincial Organisation and Development," by Mr. R. A. Dalzell.

Institution of Mechanical Engineers.—Friday, October 29th. At 8 p.m. At Institution of Civil Engineers, Great George Street, S.W. "Thomas Hawksley" lecture on "The World's Sources of Fuel and Motive Power," by Dr. D. Clerk, F.R.S.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, October 29th. At 7.30 p.m. At Bolbec Hall, Newcastle. General Meeting.

University College (University of London).—Friday, October 29th. At 5 p.m. First of six lectures on "Electric Heating and Electric Furnaces," by Prof. J. A. Fleming, F.R.S.

Association of Mining Electrical Engineers (Lancs., Cheshire and North Staffs. Branch).—Saturday, October 30th. At 6.30 p.m. At Grosvenor Hotel, Deansgate, Manchester. Presidential address by Mr. G. S. Corlett. Paper on "Colliery Electric Lighting," by Mr. Corlett, will be discussed.

NOTES.

Beattie v. Barton-Wright.—Judgment in this case, a report of the opening stages of which appears in our "Legal" columns to-day, was given on Wednesday, the plaintiff being awarded £48 1s. damages.

Dockyard Overtime. — Discharge of Electrical Workers.—The discharge of six electrical workers from Portsmouth Dockyard formed the subject of a question which was asked in the House of Commons by Mr. Chas. Duncan, M.P. He inquired of the First Lord of the Admiralty whether he was aware that the only offence brought against the men was their refusal to work overtime until 10 p.m. because sufficient notice had not been given; and that the men had been working from 7 a.m. until 9 p.m., and it was not until they were leaving work that they were informed that they had to remain until 10 p.m. Mr. Duncan also wished to know whether the First Lord was aware that one man named Henderson had not been paid a bonus to which he was entitled, the reason given being that Henderson's offence was aggravated by other offences, which had not been indicated, and of which the man himself had no knowledge; and whether the First Lord would have further inquiry made into the case, and reconsider whether the discharge of these men at a time like the present was justified by the offence committed. "My hon. friend may rest assured," replied Dr. Macnamara (Parliamentary Secretary to the Admiralty), "that it is our desire that as long notice as possible should be given to the men concerned when overtime is required, but he will realise that the exigencies of the Service make it inevitable that the notice should sometimes be short. In the present case, the 200 men concerned, who were already on overtime, were warned from 7 p.m. onwards that an extension of overtime from 9 p.m. to 10 p.m. would be required of them, the amount of notice given being all that was possible in the circumstances. No doubt some time elapsed before all the men concerned received notice. The six men referred to by my hon. friend were the only ones who failed to respond. Their cases have been very carefully considered, and I see no grounds for revising the decision arrived at."

S.A. Power Station Fire.—A fire which might have had very serious results to the Transvaal mining industry, broke out on September 9th at the Robinson Compressor Station, near Fordsburg. The prompt work of the brigade prevented any very great damage being done. The firemen were at first requested by the engineer-in-charge to stand back, as some of the oil had fired in the tanks, and a switch had ignited, rendering the situation dangerous to firemen. After consultation, however, the firemen went inside with wheelbarrows loaded with sand. They descended into the basement, and shovelled the sand on the burning tanks behind the switchboard, in the hope of putting out the fire. As this did not succeed, they next set to work with water, and after an hour the trouble was over.—*Cape Times.*

Metropolitan Association of Electric Tramways Managers.—A meeting of the members of this Association was held on Friday, 15th inst., at the Municipal and County Club, Whitehall Court, S.W., when the following were present:—Messrs. Ullmann (East Ham), chairman; Schofield (Leyton), vice-chairman; Moffet (West Ham); Mackinnon (London United); Hammond (Metropolitan Electric); Mason (South Metropolitan); and Goodyer (Croydon), hon. secretary. Letters of inability to attend were received from Messrs. Fell (L.C.C.); Bruce (L.C.C.); Murray (Walthamstow); and Stokes (Bexley). Messrs. Ullmann and Schofield were re-elected chairman and vice-chairman respectively, and Mr. Goodyer was re-elected hon. secretary. Various matters of interest were discussed,

British Association Committee on Fuel Economy.—As an outcome of the recent Manchester meeting, the British Association has invited the following gentlemen to serve on a Committee to consider and report upon the question of fuel economy (utilisation of coal and smoke prevention), from a national point of view:—Prof. William A. Bone, F.R.S., of the Imperial College of Science and Technology, London (chairman); Mr. E. D. Simon, chairman of the Manchester Air Pollution Committee (secretary); Profs. P. P. Bedson (Armstrong College, Newcastle-on-Tyne); J. W. Cobb and J. B. Cohen, F.R.S. (Leeds University); H. B. Dixon, F.R.S. (Manchester University); Thomas Gray (Royal Technical College, Glasgow); H. S. Hele-Shaw, F.R.S. (London); L. T. O'Shea and W. P. Wynne, F.R.S. (Sheffield University); and R'chard Threlfall, F.R.S. (Birmingham); together with Dr. G. T. Beilby, F.R.S. (Glasgow); Mr. Ernest Bury; and Dr. J. E. Stead, F.R.S. (Middlesbrough and the Cleveland District). The Committee, which is empowered to add, if necessary, to its members, has been selected so as to include representative chemists, engineers, and technologists from all the principal industrial areas.

Plant Inauguration at Stepney.—On Thursday last week, the extensive additions recently made to the Stepney Borough Council's generating station at Limehouse were inaugurated by the Mayor, Mr. H. T. A. Chidgey. Before calling on the Mayor to start up one of the new turbine sets, Ald. Kiley, chairman of the Electricity Supply Committee, commented on the extensive progress made by the undertaking during the last few years, and the low average prices charged in the borough. Councillor Prevost, on behalf of those present, thanked the Mayor for the assistance he had rendered, while Councillor Gordon, in seconding the vote of thanks, paid a tribute to the work carried out by Mr. W. C. P. Tapper, the borough electrical engineer, and his staff. The new plant, which we hope to describe in detail at a later date, consists of two 5,000-KW. Escher-Wyss impulse type turbines coupled to Brown-Boveri three-phase alternators generating at 6,600 volts and 50 periods. The sets are capable of supplying 25 per cent. overload for two hours, and 50 per cent. for half an hour; the speed is 1,500 R.P.M., and the full-load steam consumption about 13·3 lb. per KW.-hour. The surface condensers, also by Messrs. Escher-Wyss, have steam-turbine-driven auxiliaries, and a Heenan & Froude rotary cooler is installed for cooling the circulating air to each alternator. Between the alternators a 1,000-KW. Peebles motor converter is installed. The switchgear for the new plant is of the Reyrolle iron-clad type, and, in addition, Brown-Boveri automatic field regulators and electrical governor control are provided. In the boiler house four new Howden 33,000-lb. boilers have been installed, fitted with underfeed stokers of the moving grate type, worked in conjunction with hot-air economisers, forced draught and Prat induced-draught chimneys. The coal-handling plant has also been extended by the addition of a new telpher of Messrs. Strachan & Henshaw's make, and an electric jib crane, while other extensions include new feeders and sub-station plant. Considerable building extensions were necessary to accommodate the new machinery, which, in view of the bulk supplies to be given to the Shoreditch and Bethnal Green areas, the rapid growth of the demand in Stepney, and the reciprocal supply arrangement with the Poplar Council, will probably only meet expected requirements. The cost of the extension scheme is understood to have been about £140,000.

Charge of Stealing Electricity.—Before the Guisborough Bench on 18th inst., T. W. Barker, carrying on business as Hallimond & Co., ironmongers, Saltburn, was fined ten guineas, including costs, on a charge of stealing electricity. Mr. P. H. Monks prosecuted on behalf of the Cleveland Trust, Ltd. According to the report in the *North-Eastern Daily Gazette*, it was stated that for three months prior to July 1st defendant had had a contract with the company to supply at a fixed charge, plus 1d. per unit. For some reason or other the defendant was not satisfied with the contract, and terminated it in favour of one to pay 6d. per unit. When the company's collector visited defendant's premises it was found that only 30 units had been consumed during the last quarter, whereas, in the corresponding quarter of last year, 195 units had been used. On asking how this had come about the collector received the reply that he was very sorry, and offered to pay for the electricity. The amount of electricity consumed, and not accounted for, was valued at £8 2s. 6d. The method adopted had been to remove a bolt and insert a piece of wire, described as a "sprag," which had the effect of retarding the disk which measured the current. Mr. Charles Thompson, manager, stated he paid a surprise visit, with Sergeant Brough, on October 9th, and found the meter covered with cardboard. It was found that it had been spragged. Defendant expressed sorrow, and offered to pay for the electricity consumed. When the meter was being removed Barker offered the manager £100, but the latter replied he would not take ten times that amount. Mr. A. E. Forbes, for the defendant, stated that his client had been an "inglorious fool." Defendant had had some differences with the company, and foolishly thought to "get his own back."

The "Ward Special" Electric Vehicle.—We are informed by the Kriéger Electric Carriage Syndicate, Ltd., of 48A, Gillingham Street, S.W., that a "Ward Special" electric can now be inspected on their premises. The "Ward Special" was illustrated and described, and performance data were given, in an article on "A Low-priced Electric Vehicle," which appeared in our issue of July 16th last.

Institution and Lecture Notes.—Rontgen Society.—This Society is not making any changes in its meeting arrangements for the coming Session. The gatherings are held on the first Tuesday in each month until June next, at the Institution of Electrical Engineers. Probably about 20 per cent. of the members are with the Forces or doing service in military hospitals. The Session will open with a Presidential address, on Tuesday, November 2nd. During the recess the Council has been occupied in formulating a set of rules or recommendations for the protection of X-ray operators from the dangers attending the use of X-rays, and these will be issued shortly. They will be in the form of a card for hanging upon the wall of the laboratory, &c. The October number of the *Journal* of the Society contains a photograph of the retiring President, Sir A. P. Gould, the report for last Session, a list of the officers, and a list of members. Mr. J. H. Gardiner, F.C.S., is President for 1915-16.

Institution of Electrical Engineers (Western Local Section.—This Section holds its first meeting of the Session next Monday evening, in the Merchant Venturers' Technical College, Bristol. The chairman, Mr. D. E. Roberts, will deliver an address.

(Yorkshire Local Section).—The following arrangements are included in the programme for the first half of the Session:—

November 10th.—Chairman's address and Smoking Concert.
December 8th.—Paper on "Difficulties of Design of High-Speed Generators," by Prof. A. B. Field.
January 12th, 1916.—Paper on "The Design of High-Pressure Distribution Systems," by Mr. J. R. Beard.

Mr. J. D. Bailie is the hon. secretary.

(Glasgow Local Section.)—The provisional programme for this Section is as follows:—

November 9th, Glasgow.—Chairman's Inaugural Address.
December 14th, Edinburgh.—Paper by Mr. G. Wilkinson on "Electric Heating; its Present Position and Future Development."
January 11th, 1916, Glasgow.—Paper by Prof. Magnus Maclean and Mr. D. J. M'Kellar on "Distribution and Rise of Temperature in Field Coils." (Part II.)
February 8th.—Edinburgh.
March 14th.—Glasgow.
April 11th, Glasgow.—Annual general meeting.

Mr. Joseph Taylor is the hon. local secretary.

(Birmingham Local Section).—It has been decided that whilst it is impossible to hold the usual number of meetings during the coming session, the work of the Section shall be continued, and monthly meetings are to be held during the first half of the session, as follows:—

Wednesday, October 27th.—Chairman's Address, by Col. J. F. Lister.
Wednesday, November 24th.—Prof. A. B. Field, on "Difficulties of Design of High-Speed Generators."
Wednesday, December 15th.—Mr. J. D. Morgan (the Hon. Sec.), on "Notes on the Ignition of Explosive Gas Mixtures by Electric Sparks."

The meetings will commence at 7 o'clock, instead of 7.30 o'clock.

University College, London.—A series of six advanced lectures on "Electric Heating and Electric Furnaces" will be given by Prof. J. A. Fleming on Fridays, at 5 p.m., commencing to-day. The course is open to non-members of the University. Applications for tickets should be made to the Secretary, University College.

Fatality.—At Brixton, on 13th inst., an inquest was held into the death of Thomas Edward Green, aged 24, an electrical engineer, lately employed by the South London Electric Supply Corporation, Ltd., at Coldharbour Lane, Camberwell. According to the report of the matter in the *Morning Advertiser*, evidence was given by Mr. E. H. Ulman, the resident engineer, who said that on the previous Thursday morning the deceased, who was a fully competent man, went into one of the cells to dust the insulators. Shortly afterwards witness heard a peculiar noise, and, upon going to ascertain the cause, found the deceased leaning over the live conductors with his clothes on fire. Witness made everything "dead," and extricated the unfortunate man, who was at once taken to King's College Hospital, where he died the following day. Witness was of opinion that the deceased, who was standing on some steps, slipped and fell forward whilst looking to see if any dusting was required. He did not think Green had started dusting, as his feather duster and rubber gloves, found on the steps, were not burned. Before he had started the work the deceased would have pulled out the isolation switch and made the cell "dead." Deceased said, "I slipped, and do not know what I've done." If Green had pulled out the isolation switch the accident could not have happened. He fully understood the work, and was next in charge during witness's absence from the works. He was a careful man, and not at all likely to take any unnecessary risk. The isolation switch and the switch cell, where the deceased was found, were quite apart, and the deceased should have gone to the isolating switch first and pulled it out. That would have rendered the switch cell "dead," and, as he had not done this, witness did not think he intended to start dusting, but that he was simply looking into the cell. Dr. C. Baines, of King's College Hospital, stated that the deceased was severely burned about the face and upper part of the body. Death resulted from shock and syncope due to the burns. Deceased stated that he got mixed up in some electric wires. The jury returned a verdict of "Death by misadventure."

Lantern Slides for Lectures.—Messrs. Ed. Bennis and Co., Ltd., have a large number of lantern slides dealing with the development and present practice in connection with automatic stokers, coal elevators and conveyors, &c., which they will be pleased to loan to any responsible engineer for lecture purposes. Application for particulars of or the loan of the slides should be made well in advance of the lecture date to the firm at 28, Victoria Street, London, S.W.

Inquiries. — A portable self-contained electric lamp equipment for a kinematograph (2,000 c.p.) is wanted. Rotary switches with five points, for series-parallel connection, are inquired for.

Appointments Vacant.—Switchboard attendant (27s.), for Wakefield Corporation Electricity Works; electrical and mechanical engineer, for the Imperial Bacteriological Laboratory, Muktesar, India (350 to 400 rupees per month), age 25 to 35, by Director-General of Stores, India Office; junior charge engineer (£91), for York Electricity Works; superintendents are required for a works in a leading British Dominion, for a number of electrical manufacturing departments; men who are employed on Government work are not required. See our advertisement pages to-day.

Business Announcement.—Mr. S. G. Leach informs us that he has acquired from the Official Receiver the business of the Adnil Electric Co., Ltd., including premises, goodwill, fixtures, furniture, and stock-in-trade. He has formed a new company under the title of S. G. Leach & Co., Ltd., to carry on the business at the same address, Artillery Lane, E.C. He informs us that the company has no foreign interests, enemy or otherwise—direct or indirect—and that the shareholders, directors, and staff are entirely British.

Volunteer Notes.—Engineering Institutions' Volunteer Training Corps.—

Company Orders.—By Lieut.-Col. C. B. Clay, V.D., Commandant, for week commencing October 25th, 1915 :—

Drills, 6.15 to 7.15; 7.15 to 8.15 p.m.

Monday, October 25th.—Section 1, Technical; Section 3, Squad or Working Party.

Tuesday, October 26th.—Section 2, Technical; Section 4, Shooting.

Thursday, October 28th.—Section 3, Technical; Section 1, Shooting.

Friday, October 29th.—Section 4, Technical; Section 2, Squad or Working Party.

Sections for Technical Drill will fall in at the Headquarters of London Electrical Engineers (T.F.), at 46, Regency Street, S.W.

Sections for Squad, Signalling and Working Parties will fall in at the new Headquarters, Chester House, Eccleston Place, S.W.

All Members who have not yet been measured for Uniforms will attend at Headquarters, on Friday, the 29th inst., for this purpose.

E. G. Fleming,
Company Commander and Acting Adjutant.

3rd Batt. (Old Boys) Central London Regiment (Volunteers).—Battalion Orders by Colonel S. G. Grant (Officer Commanding), Thursday, October 21st, 1915 :—

Week-end Parades.—Saturday.—The Battalion will parade, as strong as possible, for Battalion Manœuvres, at Hanover Gate, Regent's Park, at 2.30 p.m. Dress :—Uniform, with rifles and sidearms.

Sunday.—7 a.m., Reveille. 10 a.m., Church Parade. 10.20 a.m., Parade under Company Officers. 2.15 p.m., Battalion Parade.

Map Reading and Sketching Class.—Men detailed for this work should report themselves to Mr. Page at the Bridge over the Lake, adjoining Hanover Gate, Regent's Park, at 4.15 p.m. on Friday, the 22nd inst.

Musketry.—Saturday next, the 23rd inst. There will be shooting at both Acton and Bisley Ranges, as usual. Members proceeding to Bisley must report themselves to Sergeant Cotter, at the barrier of No. 9 Platform, Waterloo Station, at 12.45 p.m.

Tuesday next, the 26th inst. Shooting at Acton, as usual.

A. G. Joiner, *Major and Adjutant*, O.B.C.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. E. A. Gleaves, who is on the staff at Stockport Corporation electricity works, was married on October 2nd to Miss Winifred Bourne, daughter of Mr. H. Bourne, formerly manager of the Cheadle (Staffs.) Railway.

The Basingstoke T.C. has increased the salary of Mr. G. Broadhurst, electrical engineer, from £180 to £200 per annum.

Mr. A. H. Jones has been appointed charge engineer at the Dover Corporation electricity works; and Mr. F. W. Davis a pupil at the works.

The Colchester T.C. has granted permission for the following officials to join the Forces :—Switchboard attendants Chignell and Blyth (Royal Engineers), and Inspector Wright, of the tramway staff.

At the Regent's Park Generating Station of the St. Pancras Borough Council on October 20th, Mr. S. P. Cook was presented with a case of pipes and a pouch, subscribed for by his colleagues at the King's Road and Regent's Park Station and many of the men, as a token of goodwill on his departure to take up the position of a senior shift engineer at the Nechells Power Station, Birmingham. Mr. Farrell, assistant shift engineer at Regent's Park Station, has been appointed shift engineer, and Mr. Brookman, senior switchboard attendant at King's Road Station, has been appointed assistant shift engineer at Regent's Park Station.

The Barnsley T.C. has increased the salaries of the following assistants at the electricity works :—Mr. T. W. Hibbert, Mr. C. Matthews, and Mr. C. Pickering, each from £150 to £160 per annum.

General.—On 7th inst., the Liverpool staff of Simplex Conduits, Ltd., gave a farewell dinner to their manager, Mr. E. Pelham Bennett, to celebrate his new appointment and promotion to the position of manager of the London and South of England district of the above company. The opportunity was taken to express their sincere regret at his departure, and in wishing him every success in his new sphere, Mr. Smith, of the Liverpool Branch, presented Mr. Bennett with a silver cigarette case, suitably inscribed, on behalf of the staff.

The many friends of Mr. A. V. Gifkins, the well-known electrical engineer, of 68, Victoria Street, Westminster, and Bankipore, India, and late of Elstown Works, Bedford, will, we are sure, regret to hear that he was very severely injured on Wednesday night last week. He is now in hospital in London, and is making slow but satisfactory progress. Needless to say, he will welcome any letters from old friends. They can be addressed to him at the office.

Mr. H. R. Mills has resigned his position as resident electrical engineer with the Cali Hydro-Electric Light and Power Co. to take up a new appointment as constructional engineer to the Popayan Hydro-Electric Light & Power Co., Colombia, South America.

Mr. G. Wilson, assistant to the Swinton and Pendlebury Council's electrical engineer, has joined the Royal Flying Corps.

Mr. Ralph J. Jefferson, of Aughton, who has just been gazetted a second-lieutenant in the 3rd South Lancashire Regiment, has been serving in the electric light department of the Lancashire Royal Fortress Engineers since 1913.

Lieutenant J. A. Baker, formerly an assistant electrical engineer in the traction department of the British Westinghouse Co., till recently in the A.S.C. in France, is now officer commanding a heavy armoured battery at the front.

Roll of Honour.—Second-Lieut. Leonard Elmslie Schultz, 2nd Battalion Wiltshire Regiment, who was killed in action on 27th ult. near Hulluch, France, was secretary of Messrs. George Schultz & Co., Ltd., London, E.C.

Sapper F. D. Rowland, of the Royal Engineers, formerly in the telegraph department of the Bury Post Office, has been wounded in France, where he was engaged on telegraph work.

Rifleman Cephas Frail, of the 12th Rifle Brigade, formerly on the clerical staff of Messrs. Hans Renolds, Manchester, has been killed in action in France.

Captain George Crellin Cartwright, Royal Warwickshire Regiment, who was killed whilst gallantly rallying a company which had suffered the loss of nearly all its officers in "the great advance," was born in March, 1882, and graduated from the Central Technical College of the City and Guilds of London Institute. He served in the 2nd Scottish Horse in the Boer War, receiving the Queen's Medal with four clasps. Captain Cartwright went to New York after the Boer War and joined the student course at the Schenectady works of the General Electric Co. (U.S.A.). After completing the course in the shops, he took a position in the foreign department of the company. He was sent to Japan by the General Electric Co., where he remained three years, returning to New York in 1910. He then went to Rio de Janeiro to represent the General Electric Co. in Brazil for about a year. While in Rio he met the late Dr. F. S. Pearson, of the F. S. Pearson Engineering Corporation, and president of the Sao Paulo and Rio de Janeiro Electric Light and Tramway Companies. Dr. Pearson offered Captain Cartwright a position in the F. S. Pearson Engineering Corporation London office in charge of engineering and purchasing work, which was accepted. He returned to London in 1911, and from that time until the outbreak of the war was associated with the F. S. Pearson Engineering Corporation, in particular in connection with the Barcelona (Spain) Power Transmission, and the Ebro Irrigation & Power Co. At the outbreak of the war, Captain Cartwright applied for a commission, and was gazetted to a second-lieutenancy early in November, 1914. He was promoted to lieutenant in April, 1915, and to captain in July last. Shortly before his death he was attached to the staff of the 22nd Infantry Brigade as a machine-gun officer. On the morning of the attack, on September 25th, Captain Cartwright, as Brigade Machine-gun Officer, was in the front line trenches with his guns, observing the English advance. A certain regiment in front had suffered the loss of nearly all its officers, and Captain Cartwright, seeing that the men needed assistance, immediately left the security of his trenches and rallied the men, and started to lead them forward again to the attack. He was shot through the right breast and lingered only two hours. Captain Cartwright was a capable and exceedingly well-informed engineer, and his excellent qualities made him many staunch friends.

Corporal Alfred O'Brien, of the 7th Battalion Manchester Regiment, who has been killed at the Dardanelles, was formerly in the employ of Messrs. L. E. Wilson & Co., of Manchester.

Sergeant Henry James Sydenham, of the 1/4th Somerset Light Infantry, who was on the staff at the Bath Corporation electricity works, has died at Peshawur, North India, where he was on service with his regiment. He was a son of the late Councillor Sydenham, of Bath.

Private J. W. Johnson, of the 11th Manchester Regiment, and Private C. W. Crook, of the 1st Lancashire Fusiliers, formerly employés at the British Westinghouse works, Trafford Park, have been killed at the Dardanelles.

Mr. John Carson, Warrant Officer, Royal Naval Reserve, a Belfast man, has just had the gold medal of the Order of St. Anne of Russia conferred upon him by the Czar in recognition of services in Russia last year. Mr. Carson, who before the war was employed as a fitter in the electrical department of Messrs. Harland & Wolff, Belfast, served in the South African War with the Imperial Yeomanry, and a brother was killed in the same campaign. Another brother is serving with the fleet in the North Sea.

Private George Morgan, of the 8th Battalion Lancashire Fusiliers, has died from wounds received at the Dardanelles. He was 20 years of age, and, prior to his enlistment in February last, was employed at the General Electric Works, Salford.

Private H. G. Priddle, of the 7th Lancashire Fusiliers, is reported missing after an engagement at the Dardanelles. He was formerly employed at the British Westinghouse Co., Trafford Park.

Private Ernest Tuson, of the 4th Battalion South Wales Borderers, was killed at the Dardanelles at the end of September. He was 31 years of age, and had for some years been a foreman in the electrical department of the L. & N.-W. Rly. Co.

Private A. Abbott, who has been wounded, was employed for some years at the works of the St. Helens Cable & Rubber Co., Ltd., Warrington.

Private George Rollason, of the 7th South Staffordshire Regiment, an electrician at Baggeridge Colliery, Penn, prior to his enlistment a year ago, has been killed in action at the Dardanelles.

Corporal Wm. Warren Davies, of the Royal Engineers, who has been killed in action in France, was, prior to the war, an inspector on the Ashton-under-Lyne Corporation Tramways.

Lance-Sergeant Daniel, of the Oxon. and Bucks. Light Infantry, who has fallen in action in France, was on the staff of the British Thomson-Houston Co., Ltd., Rugby.

Corporal Percy Stent, of the Maxim Gun Section of the Rugby Infantry Company, reported killed in action in France, was formerly with Messrs. Willans & Robinson, Ltd., Rugby. He was some time ago awarded the Distinguished Conduct Medal for bravery in capturing a German trench.

Sergeant J. Glover, of the Royal West Kent Regiment, who has been killed in action in France, was until the outbreak of war engaged with the British Thomson-Houston Co., Ltd., Rugby.

Lance-Corporal Geo. Latham, of the 9th Devonshire Regiment, who was employed at Fenton by the Potteries Electric Tramways Co., has been wounded in action, and is in hospital at Blackburn.

Lieutenant Humphrey Sharp, 11th Royal Fusiliers, who was on the staff of Messrs. Fraser & Chalmers, electrical engineers, of Erith, has been killed in action in France.

Corporal Cyril Royston Guyton Bassett, of the New Zealand Divisional Signal Company, has won the V.C. for most conspicuous bravery and devotion to duty on the Chunuk Bair ridge in the Gallipoli Peninsula on August 7th, 1915. "After the New Zealand Infantry Brigade had attacked and established itself on the ridge, Corporal Bassett, in full daylight and under a continuous and heavy fire, succeeded in laying a telephone line from the old position to the new one on Chunuk Bair. He has subsequently been brought to notice for further excellent and most gallant work connected with the repair of telephone lines by day and night under heavy fire."

Second-Lieutenant Norman B. Antrobus, of the 4th Battalion South Lancashire Regiment, who has been killed in action in Flanders, was a student in electro-metallurgy at the Manchester University.

Lance-Corporal John Dillon, of the 1st Battalion King's Own Royal Lancaster Regiment, formerly employed at the Broughton Copper Works, Salford, has been wounded. Rifleman Wm. Jennings, of the 12th Battalion Rifle Brigade, who has been killed in action in France, was also an employé at the Broughton Copper Works.

Corporal Tom Barrett, of the Rifle Brigade, whose death in France is announced, was likewise an employé at the Broughton Copper Works.

Mr. F. H. Gooch, one of the leading members of the wholesale department of Drake & Gorham, Ltd., 1, Felix Street, Westminster Bridge Road, London, S.E., has been killed in a German trench in France. Mr. Gooch joined the Cameron Highlanders at the commencement of the war, and had been in France for several months. He came home on five days' leave in July last.

Obituary.—Col. T. E. Vickers, C.B., who was so great a power in the development of the world-famous business of Messrs. Vickers, Ltd., and who was chairman of the company for 36 years, passed away on 19th inst. at the age of 82 years.

Will.—The "Times" states that Second-Lieut. Harry Gustav Byng, 2nd Border Regiment, formerly of the Artists' Rifles, of the General Electric Co., Ltd., who was killed at Bethune on May 18th, aged 25, third son of the late Gustav Byng, left estate of the value of £73,716, with net personalty £73,617.

NEW COMPANIES REGISTERED.

S. G. Leach and Co., Ltd. (141,855).—This company was registered on October 13th, with a capital of £20,000 in 19,500 cum. pref. shares of £1 each and 10,000 ordinary shares of 1s. each, to carry on the business of electricians, electrical, consulting, mechanical and sanitary, gas, and water engineers, ironmongers, makers of and dealers in electric tramcars, motor-cars, flying machines, aeroplanes, carriages, cycles and other vehicles, manufacturers of and dealers in dynamos, motors, telephones, bells, electroliers, arc and other lamps, electric light fittings, heating and cooking apparatus, metals, india-rubber, asbestos, and other insulating materials, and chemical and medical apparatus, etc. The subscribers (with one share each) are: G. Rowson, 44, Richmond Road, Barnsbury, N., clerk; H. M. Cordrey, 128, Drakefield Road, New Cross, S.E., clerk. Private company. The number of directors is not to be less than two or more than seven; the subscribers are to appoint the first. Qualification (except directors appointed during first year, who require none), 100 shares. Remuneration (except directors in receipt of salaries), £50 each per annum. Registered office: 15-17, Artillery Lane, E.C.

Mica Lubricant Co., Ltd. (141,895).—This company was registered on October 16th, with a capital of £5,000 in £1 shares, to take over the business carried on at Candlish Street, Westoe Lane, and 63, King Street, South Shields, as the Mica Lubricant Co. Registered, to carry on the business of lubricant and packing manufacturers, manufacturers of and dealers in grease, packing and syrup, asbestos, and india-rubber goods, etc. The subscribers (with one share each) are: W. W. Wilkin, 57, Vespasian Avenue, South Shields, manager; A. P. Purvis, 4, Grange Avenue, Harton, South Shields, clerk. Private company. The number of directors is not to be less than two or more than five; the first are A. Purvis, A. P. Purvis, W. W. Wilkin (manager), L. Bird, and N. Sturrock. Qualification, 100 shares. Remuneration as fixed by the company. Registered office: 63, King Street, South Shields.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

British Arc Welding Co., Ltd. (108,759).—Capital, £15,000 in £10 shares. Return dated July 15th, 1915. 657 shares taken up. £10 per share called up on 457; £4,570 paid; £2,000 considered as paid on 200 shares. Mortgages and charges: Nil.

Christy Bros. and Co., Ltd. (90,039).—Capital, £12,000 in £1 shares (3,000 def.). Return dated July 20th, 1915. 7,926 ord. and 3,000 def. shares taken up. £1,826 paid; £9,100 considered as paid. Mortgages and charges: £4,600.

Exchange Telegraph Co., Ltd.—Capital, £96,430 in 8,023 "A" shares of £10 each, and 16,200 "B" shares of £1 each. Return dated August 11th, 1915. All shares taken up. £10 per share called up on 6,000 "A" and £2 per share on 2,023 "A."; £64,046 paid; £32,384 considered as paid, being £1 per share on 16,200 "B" and £8 per share on 2,023 "A." Mortgages and charges: Nil.

Electro Flex Steel Co., Ltd.—Issue, on September 28th, 1915, of £4,900 debentures, part of a series of which particulars have already been filed.

Enfield Electric Cable Manufacturing Co., Ltd.—Deed of further charge on certain hereditaments and premises dated September 30th, 1915 (supplemental to mortgage dated November 5th, 1914), to secure £11,250. Holders: Viscount Grimston, The Camp, St. Albans; C. J. Andrews, 40, West Campbell Street, Glasgow; and F. Plutte, Fontainbleau, Dacres Road, Forest Hill, S.E.

Electrical Oil Refining Co., Ltd. (43,126).—Capital, £5,000 in £1 shares. Return dated September 10th, 1915. 4,375 shares taken up. £882 paid; £3,493 considered as paid. Mortgages and charges: Nil.

Blackburn, Starling and Co., Ltd. (61,302).—Capital, £12,000 in £1 shares. Return dated August 5th, 1915. All shares taken up. £8,100 paid; £3,900 considered as paid. Mortgages and charges: Nil.

CITY NOTES.

Montevideo Telephone Co., Ltd.

The directors, in presenting their accounts for the year ending July 31st last, state that after providing for all charges in Montevideo and London, the net profit for that period is £25,776, as against £28,525 for the previous year. This falling off in the profit is due to the diminution in the number of subscribers, owing to the depressed business conditions which prevailed during the year. The interim dividends paid on May 1st last absorbed £4,343, leaving a balance of £21,434, plus £5,303 brought forward, making an available balance of £26,737. After applying £8,000 to depreciation of the company's property and plant, and transferring £9,000 to reserve for renewals, the directors recommend the payment of final dividends of 2½ per cent. upon the preference shares and 3 per cent. upon the ordinary shares, making for the year 5 per cent. on the preference and 6 per cent. on the ordinary shares, leaving £5,394 to be carried forward.

The meeting is called for October 27th.

Barbados Electric Supply Corporation, Ltd.

The directors report that for the year ended June 30th, 1915, the trading profit amounted to £2,231, as compared with £1,381 for the previous year, in spite of a decrease in the profit from installation work and sales of electrical apparatus and stores. The war has naturally reduced the number and size of new installations, and results have been affected by the increase in the cost of materials. £504 has been charged against trading for repairs and renewals, as compared with £483 in the previous year. This item again represents principally the cost of replacing poles, which expense is expected to continue for some time. The members of the advisory committee in Barbados have agreed to accept, as from the last date of payment, viz., December 31st, 1912, half the fees previously paid. A moiety of the fees already charged in the

accounts for the 18 months from January 1st, 1913, to June 30th, 1914, has been credited, therefore, to profit and loss account as at June 30th, 1914. No fees have been paid to the directors, or to the members of the local advisory committee, since the issue of the last annual report, although, as previously, the fees for the year have been debited in the profit and loss account. The growth of the company's service is shown by the following figures:—

	Consumers connected at June 30th.	25 C.P. equiv. connected at June 30th.
1912	247	5,201
1913	456	9,430
1914	737	12,715
1915	997	15,036

In view of all the circumstances, the directors consider that excellent progress has been maintained during the past year. Capital expenditure during the year amounted to £1,103, being principally the cost of new house connections and small necessary additions to the mains. The negotiations for the supply of power to the Tramway Co. have been practically in suspense as a result of the war, but it is hoped that discussion may be resumed later.

Annual meeting: October 28th, in London.

Ferranti, Ltd.

The directors report that for the year to June 30th, 1915, the profit on trading for the year was £37,231, and, after crediting discounts, interest, and transfer fees, and deducting general establishment charges, repairs and renewals, legal expenses, income tax, bad debts, directors' and trustees' fees, there remains £16,739. The amount at credit at June 30th, 1914, was £2,050, making £18,789. From this there has been deducted interest on first mortgage debenture stock £4,438, interest on five-year notes £2,052, interest on bank loans £1,271, depreciation reserve account £10,000, leaving to be carried forward £1,028. The results for the year show a falling off as compared with the previous year, but this is due in a considerable measure to the dislocation created by the war, and the heavy falling off in export business due to the same reason, and also to adverse monetary conditions. The company have entered into a contract with the Government for a supply of shells and fuses, and as considerable outlay will be necessary in buildings and plant, arrangements have been made with the Government, under which certain advances are made by them for this purpose, and the consent of the debenture-holders and shareholders has been duly obtained. The construction work is proceeding satisfactorily, and the directors hope that deliveries will commence shortly. The works of the company were declared a controlled establishment under the Munitions of War Act, 1915, on September 6th, 1915. During the year £3,046 first mortgage debentures have been redeemed, and the loans against five-year notes and second mortgage debentures have been further reduced.

Annual meeting: October 29th, in London.

Italian Electrical Companies.

The Italian General Electricity Co. (Compagnia Generale Italiana di Elettricita), of Milan, closed the year 1914-15 with a loss of £1,400. The share capital is £60,000, and a loss is reported to have been incurred in every year since the formation of the company, four years ago.

The Mining and Electrical Co. of Valderno (Società Mineraria ed Elettrica), of Florence, which has a share capital of £320,000, realised net profits of £21,000 in 1914-15. A dividend of 4s. per £4 share has been declared.

The Brescia Electrical Co. (Società Elettrica Bresciana), of Brescia, reports net profits of £61,000 for 1914-15, as compared with £54,000 in the previous year. After placing 5 per cent. to the reserve fund the balance has permitted of the payment of a dividend of 6 per cent. for the year.

The "Dinamo" Electrical Undertakings Co. (Società Imprese Elettriche "Dinamo"), of Milan, which is associated with the Brown-Boveri group, earned net profits of £9,600 in 1914-15, as compared with £6,900 in the previous year, on a share capital of £200,000. The increase is attributed to the fact that the company's plant has now passed from the preparatory period to that of full working. It is intended to distribute 4 per cent., as contrasted with 3 per cent. in 1913-14.

The Italian Westinghouse Co., which has a paid-up capital of £160,000, reports that the year 1914-15 opened under favourable auspices, and had a fairly normal course, despite the international political situation. Orders of the value of £400,000 were brought over from 1913-14, and further contracts for £220,000 were booked during 1914-15. The deliveries amounted to £382,000, and the year closed with orders on hand for the sum of £244,000. The gross profits reached £29,000, of which £15,000 has been devoted to the extinction of losses, and the balance applied to the purpose of depreciation.

The Italian Aluminium Co. (Società per la Fabbrizione dell' Allumino ed Altri Produtti del' Elettrometallurgia), of Rome, reports that the more satisfactory results achieved in 1914 were due, in addition to the advance in the price of aluminium in the second half of the year owing to the war, to the improvements effected in manufacturing, which had increased the efficiency of the furnaces and the production; the furnaces were still in course of completion. The gross profits amounted to £16,700, of which £12,000 has been placed to the depreciation account and £4,000 to the reserve fund, leaving £7,000 to be carried forward to 1915.

The Piedmont Carbide of Calcium Co. (Società per la Fabbrizione del Carburo di Calcio e Produtti Affini), of Rome, whose works are situated in the valley of the Aosta, states that, notwithstanding the developments caused by the political situation and the floods, the balance sheet which closed on December 31st, 1914, did not present material variations from that of the preceding year. The output comprised 1,528 tons of carbide, 2,041 tons of raw calcium cyanamide, 1,753 tons of refined cyanamide, and 110 tons of silicon for aeronautical purposes, the last-mentioned being produced at the request of the Ministry for War. After making provision for depreciation, the net profits are returned at £4,900, rising to £5,000 with the balance brought forward, and a dividend of 4s. per share has been declared on share capital of £80,000.

The Galileo Ferraris Electrotechnical Construction and Installation Co. (Società Elettrotechnica Galileo Ferraris per Construzione ed Impianti) is the new title of the A.E.G.-Thomson-Houston Co., of Milan, which has an ordinary share capital of £360,000. At an extraordinary meeting of the company held at Milan, on October 12th, when the change in the title was sanctioned, the report presented by the directors stated that the company had always followed a programme of purely national activity, which was proved by the large works erected in the country. The company intended henceforth, also, to express its purely national character by assuming the name of Galileo Ferraris, through whose ingenious discovery of the rotary magnetic field the principal part of the industry had originated. At the same time, the meeting elected three Italians resident in Paris and two in Milan in substitution for five foreign directors, and the chairman undertook to convey to the family of the distinguished Italian the thanks of the shareholders for their consent to the use of his name in the title of the company.

Anglo-American Telegraph Co., Ltd.—Interim dividend for the quarter ended September 30th, 1915, of 15s. per cent. on the ordinary stock, and £1 10s. per cent. on the preferred stock, less income-tax at 3s. 2d. in the £, payable November 1st.

Calcutta Tramways Co., Ltd.—Interim dividend of 3 per cent., less income-tax, on the ordinary shares.

Brazilian Traction, Light and Power Co., Ltd.—A dividend of ½ per cent. on the issued ordinary capital stock is announced.

Callender's Cable and Construction Co., Ltd.—The directors announce an interim dividend at the rate of 10 per cent. per annum, less income-tax, on the ordinary shares for the half-year.

Reduction of Capital.—Holophane, Ltd.—A petition for the confirmation of the reduction of the capital from £200,000 to £105,000 is to be heard in the Chancery Court on November 2nd.

Cuban Telephone Co.—A financial daily states that a committee has been formed for the protection of the interests of the holders of preferred stock in this company.

Montreal Light, Heat and Power Co., Ltd.—The directors have declared a dividend of 2½ per cent. on the paid-up capital stock, being at the rate of 10 per cent. per annum, for the quarter to October 31st.

STOCKS AND SHARES.

Tuesday Evening.

The principal feature in the Stock Exchange markets this week is a substantial recovery in all the securities connected with Mexico. Notwithstanding the reported failure of the Peace Conference at Washington last week, it is obvious that practical negotiations are going forward for the settlement of the country, on the basis of Carranza being recognised by the United States Government. Would-be sellers of Mexican securities have cancelled their orders, and have turned round, inquiring eagerly for cheap stock. There is little or none in the market: what there was has been swept up. Prices show rises ranging from 5 to 6 points on the week, and in all departments connected with Mexico the story is the same.

Maybe the movement is going a little too rapidly in some cases. Severe financial sacrifices will be called for from holders of stocks in existing companies that will require more money to put them once more upon a sound footing. It is doubtful whether the Treasury will consent to capital being raised on this side for the purpose of sending to Mexico; but, of course, there is plenty of money in the United States, and the interests of America in Mexico have wide ramifications. At the same time, the American drives a hard bargain; and the cost of his financial support is likely to be onerous.

Nevertheless, it would be a great pity to sell Mexican securities just now, because the latest developments look more like a step in the direction of peace than any negotiations have done up to the present. And from all indications it is obvious enough that the country is exhausted and wearied with the long-continued internecine warfare. The recovery in Mexicans as a whole was started by lively bidding for rail-

road shares on behalf of New York, and this, it was contended, would not have been indulged in had not there been sound grounds for assuming that internal peace lay near to hand.

So far as the other markets are concerned, the firmness in the War Loan stock is a pleasant feature: pleasanter, inasmuch as politics—domestic and foreign—seem to get into a more muddled condition every day. To catalogue the various minor difficulties may be a grateful task to that section of the Press which gloats over any happening that can be distorted into a sensation or a weapon for driving wedges of disunion between parties and classes. The Stock Exchange keeps on its way with a good deal more coolness and resolution than are displayed in certain other quarters. Prices are well maintained; and the volume of business, although small, is sufficient to pay electric lighting bills in these days of compulsory darkness. Sometimes there is a little money over wherewith to buy bread, but this is not always the case.

The Home Railway market has got into such a stagnant condition that it took with complete philosophy and indifference the news that substantial additions are to be made to the war bonus awarded to various grades of the service. Some, indeed, profess relief at the finality which the arrangement strives to impose; though sceptics are not wanting who wonder how long the new arrangements will be permitted to last. Prices generally are heavy, in the absence of support; but the Undergrounds have maintained their prices with a good deal of steadiness. The London & South-Western Railway's electrified portion is understood to be nearly ready for public use, and the first section will be opened on Monday next. The "jumpy" Special Constable who sees unusual flashes in the south-western sky is quieted by the assurance that these lights are caused by the trials being run nightly with the new plant and rolling stock.

Amongst the home electricity shares, the only changes are falls of ¼ in Charing Cross ordinary and of ½ in London Electric preference, the last-named following a decline of similar amount a week ago. There is not much doing in this market, as may well be supposed; but a little demand still exists for some of the best kind of debenture stocks.

In the telegraph section, Anglo-American preferred has risen to 101½. The company has declared the usual quarterly dividends. The deferred put on ⅝ to 22¾, but is still standing relatively lower than the preferred stock, although between the security of the two issues there is not a great deal of difference. The preferred would appear to be fully, if not over, valued at 101½, since the dividends are paid less tax and the return on the money is scarcely 6 per cent. The deferred has still scope for improvement, and the price may be expected to go to the neighbourhood of 25. But the preferred might be sold and the proceeds invested in something with better prospect of improvement.

Eastern Extension shares and Eastern Telegraph ordinary stock have both regained their dividends. Great Northerns rose ½ to 33¼. Oriental Telephone preference fell back to 17s. 6d., but the ordinary remains steady at 38s. 9d. on the declaration of an interim dividend of 4 per cent., tax free. The United River Plate Telephone Co. has declared an interim dividend of 3 per cent., also free of tax. Both kinds of Globe shares are ⅛ better. New York Telephone bonds further improved, and are now demonstrably too high, in view of the yield from the 4½ per cent. War Loan—to take only one security. In Marconis there is not much doing. Americans have been dull at 17s., but have recovered a few pence; and Canadians are neglected.

Telegraph Constructions are 10s. higher at 31½, but British Insulated ordinary have come on offer again, relapsing to 10⅜. Save for these changes, the list of manufacturing shares is steady and practically unaltered. There has been a little buying from Holland of Henleys, in consequence of the big return now offered by the shares.

Brazilian issues in general are distinctly better. Brazil Tractions have regained their little fall, hardening again to 50; while the preferred are an active market in the neighbourhood of 88. Canadian General Electrics have risen 6 points within the last two days, standing now at 116½. Most of the securities generally associated with the name of Latin-Canadian are decidedly strong.

The report of the International Lighting Association contains a reference to the decreased profits of the Para Gas Co., owing chiefly to the severe competition of the Para Electric Co. As a result of negotiations, the Electric Co. entered into an agreement to take over the gas undertaking on terms, the acceptance of which the Gas Co. directors strongly recommended to their share and debenture holders; and the transaction was duly completed four months ago. Victoria Falls Electric shares are quietly firm, with some inquiry on Cape account for the ordinary shares. Consolidated Gas, Electric Light & Power, of Baltimore, holds its recent rise.

The market for rubber shares is fortunate in getting rather more than its proportion of business, as compared with other sections of the industrial department. Raw rubber has gone back a shade, but this has made no difference to the strength of the share market. The armament group is quiet and firm. Copper issues are on the rise, a full-dress boom in Wall Street forcing up the price of copper shares, together with those of railroads and industrials, the latter including quite a number of shares in various American electrical undertakings. The robust strength of the New York market is due this time not so much to the gyrations of the exchange, but to the prosperity of the Continent at large.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend, 1914.	Price Oct. 19, 1915.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.				
Brompton Ordinary	10	7½	—	£6 18 4
do. 7 per cent. Pref.	7	7	—	5 0 0
Charing Cross Ordinary	5	3½	— ¼	7 2 10
do. do. do. 4½ Pref.	4½	3⅝	—	6 0 0
do. do. City Pref.	4½	3⅝	—	6 8 7
do. 4 Deb.	4	80	—	5 0 0
Chelsea	5	4½	—	5 17 8
do. 4½ Deb.	4½	87	—	5 3 6
City of London	9	12½	—	7 7 0
do. do. 6 per cent. Pref.	6	10½	—	5 11 4
do. do. 5 Deb.	5	100	—	5 0 0
do. do. 4½ Deb.	4½	85	—	5 6 0
County of London	7	10½	—	6 16 7
do. do. 6 per cent. Pref.	6	10½	—	5 17 8
do. do. 1st Deb.	4½	90	—	5 0 0
do. do. 2nd Deb.	4½	85	—	5 6 0
Kensington Ordinary	9	6½	—	7 4 0
London Electric	4	1⅝	—	8 8 4
do. do. 6 per cent. Pref.	6	4½	— ½	6 13 4
do. do. 4 Deb.	4	80	—	5 0 0
Metropolitan	8½	2½	—	7 15 7
do. 4½ per cent. Pref.	4½	3⅝	—	6 0 0
do. 4½ Deb.	4½	90	—	5 0 0
do. 3½ Deb.	3½	70	—	5 0 0
St. James' and Pall Mall	10	6⅝	—	7 8 2
do. do. do. 7 per cent. Pref.	7	6¼	—	5 12 0
do. do. do. 3½ Deb.	3½	70	—	5 0 0
South London	5	2⅞	—	6 19 0
South Metropolitan Pref.	7	1 5/16	—	6 14 0
Westminster Ordinary	9	6⅝	—	6 13 4
do. 4½ Pref.	4½	4½	—	5 9 0
Telegraphs and Telephones.				
Anglo-Am. Tel. Pref.	6	101½	+1	5 18 6
do. Def.	1½	22⅝	+ ⅜	6 11 10
Chile Telephone	8	6¼	—	6 3 0
Cuba Sub. Ord.	5	8	—	6 5 0
do. Pref.	10	15	—	6 13 4
Eastern Extension	7	11 7/16xd.	+ ⅛	*6 14 9
do. 4 Deb.	4	80	—	5 0 0
Eastern Tel. Ord.	7	119xd.	+1	*6 14 7
do. 8% Pref.	8½	66	—	5 6 0
do. 4 Deb.	4	81	+1	4 19 0
Globe Tel. and T. Ord.	6	9⅞	+ ⅛	*6 19 0
do. Pref.	6	9¾	+ ⅛	6 1 6
Gt. Northern Tel.	22	33¼	+ ½	6 11 4
Indo-European	13	47	—	6 18 4
Marconi	10	17	—	6 8 0
New York Tel. 4½	4½	101½	+ ½	4 8 6
Oriental Telephone Ord.	10	14 5/16	—	5 8 1
do. Pref.	6	⅞	— ⅛	6 17 2
Tel. Egypt Deb.	4½	80	—	5 0 0
United R. Plate Tel.	8	5⅜	—	*8 2 6
do. Pref.	5	4⅞	—	5 2 7
West India and Pan.	1	1	—	10 0 0
Western Telegraph	7	12⅛	—	*6 13 4
do. 4 Deb.	4	80	—	5 0 0
Home Rails.				
Central London, Ord. Assented	4	69	—	5 16 0
Metropolitan	1½	23	—	6 8 8
do. District	Nil	13	—	Nil
Underground Electric Ordinary	Nil	1⅜	—	Nil
do. do. "A"	Nil	5/6	—	Nil
do. do. Income	6	71	—	*9 11 8
Foreign Trams, &c.				
Adelaide Sup. 6 per cent. Pref.	6	5	—	6 0 0
do. 5 Deb.	5	97	—	5 3 0
Anglo-Arg. Trams, First Pref.	5½	8⅛	—	7 17 2
do. 2nd Pref.	5½	8	—	9 3 4
do. 4 Deb.	4	74	—	5 8 1
do. 4½ Deb.	4½	74	+2	6 1 7
do. 5 Deb.	5	75	—	6 13 4
Brazil Tractions	8½	50	+ ½	7 0 0
Bombay Electric Pref.	6	10½	—	5 17 1
do. 4½ Deb.	4½	87	—	5 3 0
Mexico Trams	Nil	34	+1	Nil
do. 5 per cent. Bonds	—	47	+10	Nil
do. 6 per cent. Bonds	—	44	+9	Nil
Mexican Light Common	Nil	28	+5	Nil
do. Pref.	Nil	37½	+7½	Nil
do. 1st Bonds	—	46	+9	—
Manufacturing Companies.				
Babcock & Wilcox	14	9 3/16	—	6 8 5
British Aluminium Ord.	5	1 3/16	—	4 14 1
do. Pref.	6	18/8	—	6 9 9
British Insulated Ord.	15	10⅜	— ½	7 4 7
do. Pref.	6	5⅝	—	5 3 2
British Westinghouse Pref.	7⅛	8⅜/-	—	8 10 8
do. 4 Deb.	4	72	—	5 11 1
do. 6 p. lien	6	101	—	5 19 0
Callenders	15	11	—	6 16 4
do. 5 Pref.	5	4½	—	5 11 8
do. 4½ Deb.	4½	92	—	4 17 9
Castner-Kellner	15	61/-	—	4 18 6
Edison & Swan, £3 pd.	Nil	10/-	—	Nil
do. do. fully paid	Nil	1	—	Nil
do. do. 4 Deb.	4	57	—	7 0 4
do. do. 5% Deb.	5	60	—	8 6 8
Electric Construction	6	13/-	—	9 4 8
do. do. Pref.	7	19/9	—	7 1 4
Gen. Elec. Pref.	6	9¼	—	6 6 4
Henley	20	12½	—	*9 2 0
do. 4½ Pref.	4½	4½	—	5 0 0
do. 4½ Deb.	4½	92	—	4 17 9
India-Rubber	5	8	—	6 5 0
Telegraph Con.	20	31½	+ ½	7 12 0

* Allowance made for dividends being paid free of income-tax.

Correction.—In the advertisement of the Mansfield electricity department for a clerk, the printer credited the borough with having "over 100" consumers. That, of course, was ridiculous, the statement intended being "over 1,000." We regret the slip.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING SEPTEMBER, 1915.

The returns of electrical export and import business for the month of September show an all-round improvement on those of the previous month. Thus the electrical exports reached a total value of £374,418, as compared with £346,318 in August; the electrical imports were valued at £211,488, as against £202,490 in the previous month; and the re-exports of electrical goods advanced from £10,676 in value in August to £19,885 in September. Of the various items constituting the exports, it may be noted that cable exports more than doubled in value; machinery exports also reached a higher level, and lamp exports slightly improved, but in other directions, and notably in telegraphic and telephonic exports, the returns show decreased business. Machinery, telegraphic and telephonic, and lamp imports reached higher values during the month, only partly counter-balanced by falling off in other lines.

India, Victoria and New South Wales were our best customers, while it may be noted that Scandinavian and French purchases remain at a high level. Importation from the States fell off slightly, and Dutch lamp imports increased, reaching over £10,000 in value.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Destination of exports and country consigning imports.	Electrical goods and appliances.	Wires and cables rubber and other insulations.	Electric lighting fittings and accessories.	Electric glow lamps.	Electric arc lamps and lamp parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	4,062	9,765	840	2,018	2,518	1,050	8,419	214	12	104	503	7,435	36,740
German West Africa	11	...	...	...	...	...	...	...	11	...	...	73	95
Netherlands, Java and Dutch Indies ...	835	4,723	778	141	14	65	331	140	14	16	885	19	7,961
Belgian Congo	20	...	24	...	...	...	...	...	...	...	...	21	65
France	376	1,338	1,632	115	38	47	5,037	4,636	400	100	490	5,281	19,487
Portugal	54	363	357	144	...	...	53	284	120	...	953	598	2,926
Spain, Canary Isles and Spanish N. Africa...	203	231	5	17	...	488	356	192	12	...	256	416	2,176
Switzerland, Italy and Austria-Hungary ...	866	171	244	...	...	168	3,593	68	...	...	127	2,377	7,614
Greece, Roumania, Turkey and Bulgaria ...	...	28	...	...	...	...	71	...	...	...	...	77	176
Channel Isles, Gibraltar, Malta and Cyprus...	195	10	151	50	...	238	38	11	11	...	4	364	1,072
U.S.A., Philippines and Cuba	385	...	726	49	...	...	906	...	296	13	44	961	3,380
Canada and Newfoundland	7	...	577	348	...	1,137	4,196	...	612	...	29	179	7,085
British West Indies and British Guiana ...	13	10	...	106	...	...	...	...	40	...	31	828	1,028
Mexico and Central America	...	20	...	36	...	...	...	...	113	...	95	134	398
Peru and Uruguay	17	277	5	25	...	...	95	72	69	...	3	80	643
Chile	132	92	4	277	...	394	373	...	...	...	28	28	1 328
Brazil	204	590	823	364	382	415	308	619	176	36	10	878	4 805
Argentina	1,068	9,001	362	534	...	930	1,199	2,728	1,187	30	5,059	518	22,616
Colombia, Venezuela, Ecuador and Bolivia...	37	247	...	331	...	...	...	...	...	...	5	...	670
Egypt, Tunis and Morocco	260	1,418	189	77	...	51	639	471	261	425	101	433	4,325
British West Africa	7	445	88	95	...	42	154	1,754	...	42	45	17	2,689
Rhodesia, O.R.C. and Transvaal	453	6,291	1,101	3,334	...	437	586	111	376	212	182	25	13,108
Cape of Good Hope	642	3,563	853	921	...	37	1,454	35	209	29	96	52	7,891
Natal	269	3,679	705	257	...	110	14,766	32	49	9	311	172	20,359
Zanzibar, Brit. E. Africa, Mauritius & Aden	58	79	51	308	...	26	280	14	...	...	220	255	1,291
Azores, Madeira and Portuguese Africa ...	102	...	191	65	...	...	40	...	72	...	...	423	893
French African Colonies and Madagascar...	15	...	45	...	...	...	48	...	...	...	...	...	108
China and Siam	466	236	323	215	57	83	2,142	616	48	11	150	609	4,956
Japan and Korea	6	126	51	14	21	113	631	...	2,830	19	...	220	4,031
India	2,509	22,002	3,824	3,102	51	1,072	8,427	3,442	1,625	111	202	649	47,016
Ceylon	312	727	148	35	42	59	559	...	65	3	26	49	2,025
Straits Settlements, Fed. Malay States and Sarawak	366	909	332	452	...	339	1,785	207	91	7	56	24	4,568
Hong Kong	...	337	23	...	58	57	132	...	91	173	582	...	1,453
West Australia	404	851	132	77	...	428	229	...	74	...	29	43	2 267
South Australia	329	4.326	256	200	...	23	154	...	16	7	8,395	657	14,363
Victoria	438	28 391	2,868	949	...	382	14,730	100	1,108	...	788	...	49 754
New South Wales	510	9,617	1,576	2,708	133	407	11,469	7,673	1,139	33	4,615	1,322	41,202
Queensland	100	...	446	...	...	76	265	247	403	...	2 696	...	4,233
Tasmania	...	...	43	44	...	...	2,173	...	87	46	580	...	2,973
New Zealand and Fiji Islands	240	4,872	1,875	651	...	1,330	3,932	43	180	...	11,231	294	24,648
Total, £	15,971	114,735	21,648	18,059	3,311	10,004	89,570	23,709	11,797	1,420	38,677	25,511	374,418

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Russia, Norway, Sweden and Denmark ...	39	2,210	35	146	674	460	10,390	3,630	1,941	984	9,393	29,902
Germany	...	...	...	...	...	...	...	...	...	...	...	...
Holland...	...	1,018	275	10,076	22	...	282	...	435	...	387	12,495
Belgium	...	...	...	...	...	...	...	...	...	...	45	45
France	120	2,637	360	3 349	2,230	603	109	40	4,725	3,398	89	17,660
Switzerland	1,306	10	315	280	86	419	6 859	14	200	1,635	1,181	12,305
Italy	2	4,397	6	...	...	32	2,477	...	...	130	...	7,044
Austria-Hungary	...	...	...	...	...	...	...	...	...	...	...	...
United States	8,694	7,860	2,692	1,977	5,085	176	13,841	66,167	7,954	5,274	7,659	27,379
Total, £	10,161	18,132	3,683	15,828	8,097	1,690	33,958	69,851	15,255	11,421	18,754	206,830

Additional imports.—Spain, lamp parts, £274; carbons, £2,167; Victoria, telegraph and telegphone apparatus, £83; Canada, wires and cables, £1,329; electrical goods, £605; machinery, £200.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

Various countries, mainly as above... ...	1,997	3,316	...	504	125	1,214	2,470	...	166	258	9,935	19,885

TOTAL EXPORTS: £374,418 TOTAL RE-EXPORTS: £19,885 TOTAL IMPORTS: £211,488

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns. Imports are credited to the country whence consigned, which is not necessarily the country of origin.

OUTPUT OF COAL AND THE USE OF ELECTRICITY IN MINES.

From latest reports of H.M. Inspectors of Mines we learn the total output of coal for the different districts of the British Isles, during 1913 and 1914, was as follows :—

District.	Year 1914. Tons.	Year 1913. Tons.
No. 1 district, Scotland	38,847,362	42,456,516
No. 2 „ Northern	52,384,478	58,675,687
No. 3 „ York and North Midland	66,807 623	72,951.841
No. 4 „ Lancashire	26,200,447	28,130,845
No. 5 „ South Wales	53,879.728	56,830,072
No. 6 „ Midland and Southern	27,430.992	28 284,387
Totals	265,550,630	287,329,348

which shows a decrease of 21,778,718 tons.

The value of the coal worked in 1913 is given as £145,210,493, and for the year 1914, £132,536,184 ; so that the loss in money due to the lessened output was £12,674,309 sterling. The loss is, of course, due to the dislocation of trade following the outbreak of war, and especially of shipping, upon which so many collieries depend. This is most noticeable in Nos. 2 and 3 districts, embracing the whole of the North of England and Yorkshire. Scotland, too, was affected in the same way, and in about the same proportion. The loss in value is equivalent to rather more than 10 per cent., and, under the circumstances, matters might have been much worse.

It is interesting to note, however, that in Ireland, which is in No. 4 division, the output increased by nearly 10,000 tons, viz., from 82,521 tons in 1913, with a value of £50,654, to 92,400 tons, the value of which is given as £54,993 ; also that 130,440 tons of coal with a value of £73,566 was produced from the Kent coalfield.

It is also interesting to note, in view of all that has been said recently in regard to the price of coal to the consumer, that the value at the pit, according to the figures given above, works out at about 10s. per ton. It must, however, not be forgotten that this is the average price, as much of the coal would be sold for less than this figure, and the better qualities would, of course, command a much higher price, and as it is the better class of coal which mostly is used in households and around the price of which most of the discussion has centred, it is rather misleading to assert, as we believe has been done by those who ought to know better, that coal costing 25s. to 30s. per ton to the customer is worth only 10s. at the pit. Then there are to be added the cost of wagon hire, carriage, wharf, and siding dues, which amount in very many cases to nearly as much as the coal is worth, and to-day good house coal at the pit costs from 20s. to 25s. per ton. The reason for the advance in the price of coal is due first to the great increase in the wages of miners, and secondly, to the increased cost of timber and general stores consumed by the collieries ; and it is most likely that the price of coal will remain high—possibly at a higher level than at present—for a long time to come, the chief reason for this being the scarcity of labour and the inordinate demand of the miners for higher wages as the price of coal increases.

The remedy for this, of course, is the introduction of coal-cutting and labour-saving machinery generally, and as wages increase the tendency will undoubtedly be to displace manual labour by machinery, as the saving effected is much more apparent when wages are high than when low, as they have been in this country when compared to wages in the United States of America, for instance, where coal-cutting machinery is used to a very much greater extent. The advantages of coal-cutting machinery in this country are rapidly becoming more and more recognised by colliery owners, and it is satisfactory to note that 169 more machines were installed during the year 1914. The total number of machines at work was 3,111, of which 1,415 were driven by electricity and 1,696 by compressed air. The following table shows the number and type of machine, together with the quantity of mineral mined by their use. It also gives the number of conveyors in use at the coal-face.

This table emphasises the superiority in numbers of the electrical machines to those driven by compressed air, in the case of the long-wall face type of machine, viz, the disk, bar and chain types. The proportion is nearly two to one, there being 1;407 of the former to 734 of the latter. As regards the percussive type of machine, this unfortunately cannot—so far—be driven satisfactorily by electrical means, but we have no doubt that even many of these machines were operated by compressed air generated by an electrically-driven air-compressors. The output of these machines is small compared to the long-wall type of machine. Of the total output of coal obtained by machines, viz.,23,976,371 tons, only 2,163,851 tons, or less than 10 per cent., was obtained by percussive machines. The coal cutter of the future is undoubtedly the electrically-driven long-wall type of machine. The percussive machine is limited in its operation, as it must be fixed in one position while at work, but the great disadvantage is the extremely high cost in consumption of air for its limited output. An electrical machine—could one be satisfactorily devised—would no doubt be operated at one-third the cost for energy.

There were 408 conveyors at work at the coal-face, and this method of dealing with the coal after being mined is slowly but surely gaining ground. The reports do not say how these were operated, whether electrically or by compressed air, but as they are in use, on long-wall faces, it may may be quite safely assumed, as most of the coal-cutters are

Coal-Cutting Machines and Conveyors.

District.	Electrically-driven machines. Type. Disk.	Bar.	Chain.	Percussive.	Rotary heading.	Statute tons of mineral cut. Coal. Tons.	Ironstone. Tons.	Fireclay. Tons.	Conveyors.
1	515	216	12	2	2	7,808,984	53,532	2,964	128
2	58	33	63	2	—	1,256,433	—	—	68
3	157	87	104	—	2	3,556,410	—	—	116
4	7	19	8	—	—	355,650	—	—	27
5	3	38	3	—	—	242,747	—	—	63
6	35	20	29	—	—	770,654	161,192	—	6
Total	775	413	219	4	4	13,990,878	214,724	2,964	—
	Compressed-Air Driven Machines.								
1	119	7	—	40	—	1,313,593	16,572	—	—
2	61	15	8	451	11	2,317,879	—	—	—
3	175	60	35	99	6	3,549,722	—	27,007	—
4	117	34	5	209	—	1,733.922	—	—	—
5	1	50	7	29	—	392,079	—	—	—
6	14	6	20	94	5	678 298	36,883	—	—
Total	487	172	75	922	22	9,985,493	53,455	27,007	—
Grand total ...	1,262	585	294	926	26	23,976,371	268,179	29,971	408

electrically operated, the majority of the conveyors would also be worked by electricity.

What strikes one most from an examination of the foregoing table, is the enormous development of machine mining in Scotland. More than half of the electrically-driven long-wall machines in use in the collieries of Great Britain are in Scotland, and these machines obtained practically one-third of the whole of the coal output obtained by machine mining. Surely if coal-cutting pays in one district to such an extent, it would seem to be worth very much more consideration in the other districts than it is evidently receiving. Of the 38 million tons of coal produced in Scotland, one-fifth was obtained by machine mining.

In regard to the use of electricity in mines for other purposes, the following tables show the aggregate horse-power in use for different purposes, both below and above ground, in coal mines and metalliferous mines respectively :—

The next use of importance is haulage, and there is still room for a considerable extension in this direction. Electric winding does not seem to make much progress, especially in the North of England, where the collieries have such excellent facilities for obtaining power from the supply companies. South Wales still leads in this application of electric power.

In regard to lighting, there is a distinct improvement in the numbers of electric miners' safety lamps now being used, though, of course, the proportion is still very small, compared to the number of oil lamps in use. Of the latter there were a total of 679,572, and of electric lamps 75,507, or a little over 10 per cent. The only objection now to the electric lamp is the cost of installation and maintenance, which, no doubt, will be overcome as manufacturers gain experience, and the managers and miners begin to recognise their great advantages in efficiency and safety.

Electricity in Coal Mines.—Summary of Aggregate Horse-Power.

District.	Number of mines.	Above ground.						Underground.					Gross total.
		Winding.	Ventilation.	Haulage.	Coal washing or screening.	Miscellaneous.	Total.	Haulage.	Pumping.	Portable machinery	Miscellaneous.	Total.	
1	340	2,991	5,651½	3,478½	7,281	10,781½	30,183½	30,134⅘	50,932¼	22,149¼	3,755 9/10	106,972 1/5	137,155 7/10
2	279	11,118	18,644½	10,063½	13,485⅗	25,624½	78,936¼	40,681	42,657½	4,245¾	3,291½	90,875½	169,811¾
3	240	1,462½	10,292 3/10	3,054½	21,537 19/20	29,510 7/10	65,857 19/20	28,699	16,366¾	9,124	3,600⅞	57,790⅝	123,648 23/40
4	137	268	3,292½	1,031½	3,180½	5,345¼	13,117⅜	10 545½	9,889¾	832	1,235	22,502¼	35,620
5	291	16,372	17,924	14,693½	9,528½	35,314	93,832½	42,783	55,095½	799½	1,765½	100,443½	194,276
6	131	291½	2,216½	1,534½	3,357½	4,764½	12,164½	18,333½	19,012	2,428	1,332 1/10	41,105⅗	53,270 1/10
Total...	1,418	32,503½	58,021 3/10	33,856	58,371⅛	111,340 9/20	294,092 9/20	71,176⅘	193,953½	39,578½	14,980⅞	419,689 7/40	713,782⅛

Electricity in Metalliferous Mines.—Summary Showing Aggregate Horse-Power.

District.	Number of mines.	Above ground.					Underground.					Gross total.
		Winding.	Ventilation.	Haulage.	Miscellaneous.	Total.	Haulage.	Pumping.	Portable machinery.	Miscellaneous.	Total.	
1	8	106	⅓	30	185½	321⅘	20	178¾	—	51½	250¼	572 1/12
2	15	71	—	—	395	466	159	915	—	408	1,482	1,948
3	5	27	—	52	64	143	—	77½	—	—	77½	220½
4	8	790	150	385	801¼	2,126¼	781	1,243½	—	292	2,316½	4,442¾
5	6	130	—	10	580	720	10	110	—	15	135	855
6	12	843	3	28	3,548½	4,422½	10	1,370	—	33	1,413	5,835½
Total ...	54	1,967	153⅓	505	5,574¼	8,119 7/12	980	3,894¾	—	799½	5,674¼	13,873 1/12

It will be noticed from these tables that the greatest amount of power is used for pumping—nearly one half of the total horse-power installed underground in the coal mines, and more than one half in the metalliferous mines being applied to this purpose. Taken altogether more than one fourth of the total electrical horse-power installed in mines is used for pumping, and from this one may obtain some idea of the cost of keeping the mines clear of water.

Birmingham.—Tramway Stoppage.—On Tuesday last week the operation of the whole of the city tramways was suspended for half an hour, due, it appears, to the exceedingly heavy demands on the electricity department at the time (about dusk), to meet which it was decided to suspend the traction supply in order to maintain the manufacturing supply. It will be remembered that the Corporation has a temporary 10,000-kw. generating station practically completed at Nechells, and it was anticipated that this would be available for supply in August, but, owing to delay in plant delivery, this station is only now being completed.

PARTICULARS OF ELECTRIC TRAMWAYS IN THE COMMONWEALTH OF AUSTRALIA.

The following Table of Statistics relating to Australian Electric Tramways has been compiled by the *Commonwealth Engineer* :—

State.	Mileage (route) open for traffic.	Capital cost.	Energy generated. Kilowatt-hours.	Car-miles run.	Gross revenue.	Working expenses.	Percentage of working expenses on gross revenue.	No. of passengers carried.	No. of Cars.	No. of employés.
	Miles.	£	Thousands.	Thousands.	£	£	Per cent.	Thousands.		
New South Wales... ...	145·74	7,060,424	93,554	27,008	1,783,620	1,522,489	85 36	200,512	1,399	9,195
Victoria	61·95	841,071	6,617	4,166	193,306	144,308	74·65	28 268	183	719
Queensland...	34·55	—	7,014	3,979	300,195	—	—	44,691	149	803
South Australia	51·46	1,396,638	12,000	5 326	328,809	202,503	61·59	43,797	170	1,073
Western Australia... ...	46·83	1,065,312	4,902	2,703	186,757	127,049	68·03	17,473	119	449
Tasmania	16·73	180,790	1,562	849	56,605	33,972	60 02	6,526	47	259
Commonwealth	357·26	10,544,235	32,095	44,031	2,849,292	—	—	431,267	2,067	12,498

In addition to the above services, the following other-motive-power lines are in operation :—Steam (miles) : N.S.W., 70 ; Victoria, 1 ; Queensland, 7½. Cable (miles) : Victoria, 46. Horse (miles) : Victoria, 12½ ; South Australia, 19½ ; Western Australia, 29.

The controlling authorities of the various tramway services are :—Government (miles) : N.S.W., 211 ; Victoria, 5½ ; S. Australia, 17½ ; Western Australia, 52. Municipal (miles) : Victoria, 23½ ; Queensland, 7½ ; S. Australia, 51½ ; W. Australia, 11 ; Tasmania, 16¾. Private (miles) : N.S.W., 4¾ ; Victoria, 92½ ; Queensland, 34¼ ; S. Australia, 2¼ ; W. Australia, 14¾.

NOTES ON FAULTS IN CABLES.

By E. P. AUSTIN, A.M.I.E.E.

The construction of paper-insulated lead-covered cables is such that under certain apparently simple fault conditions localisation tests are often inaccurate. In the following lines the writer proposes to investigate some of the causes of this inaccuracy.

Paper lead cables are commonly made up in the following classes :—Single core, two and three core, and two or three concentric conductors. The triple-concentric conductors are usually installed on three-wire networks, and have the outer conductor earthed at the generating station and of half the sectional area of the other two conductors.

Insulation breakdowns can usually be attributed to damp, cracked paper, or overheating of the dielectric, the primary causes of these conditions being mechanical or electrolytic damage to the lead, faulty box glands, creeping of damp along the strands due to careless handling, abuse of the cable when laying, or overheating due to excess voltage or overload.

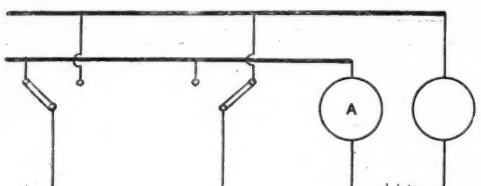


Fig. 1.

Protection against electrolysis is obtained by frequent bonding between adjacent cables, across boxes, and between traction return circuits and the lead sheath.

Faults that occur through mechanical damage subsequent to laying operations generally declare themselves at once if the cable is alive, but damage from other causes frequently results in faults that develop over a period of time depending on the environment of the cable at that point.

Dealing first with the triple-concentric cable, we will consider the indications of a fault, its development, and the type of test likely to give most accurate results.

With this class of cable, faulty lead allows the influx of damp and lowering of the insulation between the outer conductor and earth. In course of time the damp creeps along

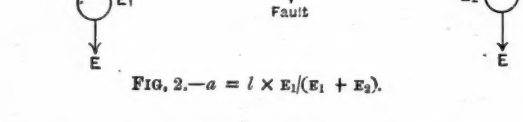


Fig. 2.—$a = l \times E_1/(E_1 + E_2)$.

the cable until the general insulation between conductors becomes low enough to form a low-resistance fault or dead short.

It is much better to localise and remove a fault before this last stage is reached and while it is possible to locate a faulty cable on a network during working.

A suitable arrangement is shown diagrammatically in fig. 1. A second neutral bus-bar is made use of, and its potential to earth varied at will by means of a battery, accumulators being the most suitable. The two-way switches form continuous contact during the change from the neutral working bus to the auxiliary bus. The method of procedure is as follows.

Choosing a period of light load, the network is divided into sections at the street pillars and boxes on all three conductors. The neutral of No. 1 section is switched on to the auxiliary bar, the accumulator switched into circui and the reading on ammeter A noted. If no current is indicated, then each section is taken in turn until the one containing the faulty cable is found.

The precise cable is discovered by transferring portions of the faulty network to the sound network until the ammeter indicates no leakage.

The faulty cable will probably be sound between the inner conductors, and possibly between each of these and the neutral, therefore the localisation test will be simple. The Murray loop test is applicable if the fault resistance is low, or a fall of potential test may be used, employing a high-resistance galvanometer or suitable voltmeter.

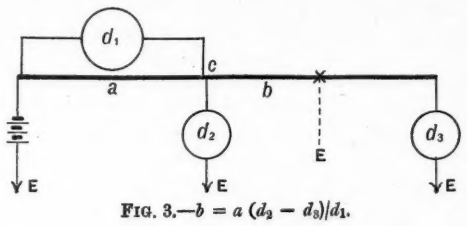


Fig. 3.—$b = a\,(d_2 - d_3)/d_1$.

In many instances a cable fails before its condition is suspected, and the resistance between all conductors becomes low. If the paper has not been too badly damaged in the region of the fault, the oil will run in between the conductors and cause the conditions to become unstable. Localising under these conditions presents considerable difficulty and takes up considerable time, as it is generally necessary to develop the fault again by applying a fairly high potential through a resistance, and maintaining a sufficiently heavy current through the fault to reduce the paper to stable condition at this point.

Before applying a test it is essential for success to

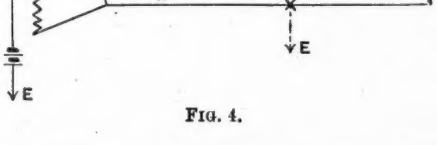


Fig. 4.

determine accurately the relative condition of the conductors to each other and earth, and from that to decide how far the requirements of a given method or methods are met.

In all methods there are certain essential requirements, which may be briefly summarised as follows for a few of the common ones.

Fall of potential, figure 2. One conductor must be sound or another sound conductor available, possibly a

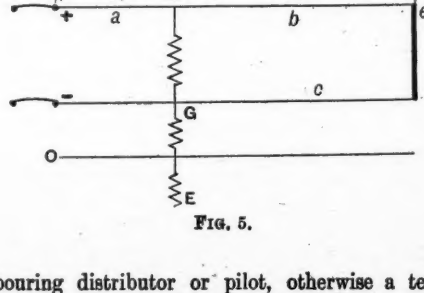


Fig. 5.

neighbouring distributor or pilot, otherwise a temporary wire must be used, which is often inconvenient. Failing these, the method in figure 3 may be used provided the point c is available. This method and its adaptations are not very accurate, as the fault resistance from either end may not be equal. When all conductors are shorted, as we have assumed, one may be used as the wire under test and its neighbour as the earth lead.

Bridge and loop methods are simple and effective. They call for one sound conductor, preferably of equal section to the faulty one, the shortest possible instrument leads, and they are most accurate when the fault resistance is low. Fig. 4 illustrates the well-known Murray loop method.

Assuming that the cable has low resistance faults between all conductors and earth, it is probable that the insulation between any two conductors will hold up under a test pressure of, say, 6 volts, and apparently fulfil the conditions necessary for the method shown in diagrams 2 or 4, but misleading results are often obtained for the following reasons :—

Fig. 5 represents the state of affairs described, and its effect on a fall of potential test.

V_1 accurately measures the drop on the length a, but V_2 is the difference of potential between e and G. The loop

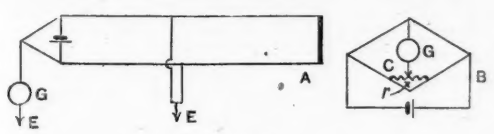


Fig. 6.

E e G is shunted by the fault resistance, and therefore V_2 will measure the drop across the fault less the drop from e to G.

The loop test is also inapplicable in these circumstances, as shown in fig. 6, where A represents the cable connections, and B the equivalent lozenge diagram, in which the resistance r represents the fault between cables having an uncertain position of the point of contact C.

The alternative methods to use are those applicable to short-circuit, namely, the fall of potential without a return wire, as illustrated in diagram 3.

The other test for short-circuit is the overlap method shown in diagram 7. The principle is self-evident from the formula given. Since the fault resistance is measured

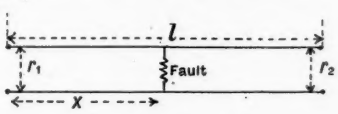


Fig. 7.

$x = (r_1 - r_2 + 2\,l\,a)/4a$ where a = resistance per yard of cable.

in this case, and not used merely as an instrument or battery connection, it is essential for success that the fault should be perfectly stable during the tests, and have the same value from either end of the cable.

Induction methods are strictly limited in their scope of usefulness on concentric cables, and are quite inoperative on armoured cables, for obvious reasons. The screening effects on concentric cables are sufficient to damp inductive phenomena, in addition to which the impulses impressed on the cable flow along the lead to any remote point of contact with earth, and there is, therefore, no definite indication of the position of the fault.

IGNITION MAGNETOS.

(*Concluded from page* 511.)

As the ignition magneto always has to work intermittently, one must endeavour to produce the maximum effect at the moment when it is doing useful work—that is, when the spark is to be produced by opening the circuit—and with this in view, it is not a matter of indifference when the circuit is closed. At very low speed the influence of closing the circuit is next to nothing; the maximum current is always produced at the moment when $d\,\mathbf{B}/d\,a$ is a maximum, and it is sufficient if the circuit is closed long enough before the rupture; it can even be closed for several cycles without affecting the value of i. At high speeds this does not hold good, and if one wishes to obtain the greatest possible current strength at the moment of break, one must take care to close the circuit at the moment of maximum flux. This is well shown in fig. 7, where Curves I and III start from zero flux, whilst Curve II corresponds to starting from the maximum flux. These curves are calculated by the method given on p. 510, for the same coil as fig. 6, and for a speed of 20 revs. per second. Between the limits shown the strength of current varies, but it is clear that the best result is always attained when closing is effected in the sector 0°—90° for the spark to take place in the neighbourhood of 180°, and that it is necessary to approach 90° as closely as possible.

It might appear that, this point having been established, there would be no difficulty in fixing once for all on the point 90°; in reality, however, practical conditions sometimes require complete closing during more than one revolution, and then it is found that the *useful* current strength diminishes when the speed increases! In other cases, on the contrary, the duration of closed circuit has to be reduced, and the consequence is a weakening of the useful effect. Finally, it happens with magnetos that have a double winding that the secondary current has sufficient influence to disturb the *régime* described above, and sparks are sometimes produced at times other than the break; each case, therefore, requires special consideration, with the help of the foregoing information.

As the variation of the maximum current with the moment of closing occurs only at high speeds, when the current strength is almost always more than sufficient, apparently it might be neglected without inconvenience; as a matter of fact, however, it must not be forgotten that, in spite of the considerable volume of the magneto relatively to its useful output, it is a machine of which the heating is always to be feared, and although a premature closing of the circuit may diminish the maximum current strength at the point of rupture, it has also the grave drawback of materially increasing the R.M.S. value of the current, and, consequently, the heating effect.

The coefficient Z mentioned on page 511 depends entirely on the magnetic circuit, and, as already indicated, it is proportional to the limit of the ratio of the current strengths at very low and at very high speeds.

If the flux had a sinusoidal wave-form, the value of Z would be unity; this is one of the few cases in which it is possible to make the calculation. In the case of magnetos, for want of being able to determine to a sufficient degree of accuracy the maximum value $d\mathbf{B}/da$, we must be content with the approximation obtained by the direct measurement of the variations of flux $\Delta\,\mathbf{B}$ for angles $\Delta\,a$, whence $Z = \text{max. } \Delta\mathbf{B}/\Delta a \div \text{max. } \mathbf{B}$; or the elongations θ, which are proportional to the variations $\Delta\,\mathbf{B}$ (page 510) are utilised, replacing $\Delta\,a$ by $2\pi/p$ for p measurements per revolution,

$$Z = \frac{p}{2\pi}\,\frac{\text{max. } \theta}{\frac{1}{2}\sum_{-\phi}^{+\phi}\theta}.$$

Very numerous measurements made on good magnetos of different makes show that Z varies between 4·5 and 7, although the machines are almost identical in appearance.

Considerable changes in the form of the curves of flux result from very small differences in the shape of the elements of the magnetic circuit. Generally speaking, the pole-pieces P_1 and P_2 and the shoes A A of the **H** armature subtend equal angles of 90° (B in fig. 8), and as the air-gap $\rho_2 - \rho_1$ is very small, the width d of the shoes is practically equal to the opening D between the tips of the pole-pieces. It is preferable to allow a small overlap, making $d >$ D rather than $d <$ D. When the overlap is small, of the order of 1 mm. in ordinary cases, the ratio Z remains almost constant.

On the other hand, if $d <$ D, even for a difference of 1 or 2 mm., the flux curve shows a kind of step corresponding to the passage of the shoes between the pole horns, and the curve $d\mathbf{B}/da$ presents a double peak (fig. 9), so that with equal maximum flux the coefficient Z may have a value of 3; the magneto, whilst quite suitable for normal speeds, makes bad startings. The failure of several models was due to this cause.

The air-gap $\rho_2 - \rho_1$ ought to be made as small as the mechanical conditions will permit; it is often less than 0·2 mm. If it is further reduced there is a risk of the shoes touching the pole-pieces through wear of the bearings.

If the air-gap is increased, another defect is introduced; the flux is reduced, but what is more serious, the maximum variation falls more rapidly still, and the value of the coefficient Z becomes very low. Fig. 10, which relates to two air-gaps of 0·2 and 0·45 mm., with a radius ρ_1 of 28 mm., illustrates this point; to facilitate comparison, the curves for the two air-gaps have been displaced with regard to one another by an angle of 90°. They show that the flux is equal to 63,500 maxwells for an air-gap of 0·2 mm., and 56,400 for 0·45 mm.; but at the same time Z falls from 5 to 3·8. This clearly demonstrates the importance of small air-gaps.

The power of the magneto being a function of the maximum flux S $\mathbf{B}_{max}$, and $\mathbf{B}_{max}$ being dependent on the quality of the iron used, the only independent variable is really S, the cross-sectional area of the core (= N E in fig. 8). It is advisable not to press the induction too far, to avoid trouble from hysteresis, and from the saturation of the iron. With sheet-iron laminations of good quality, the induction may be from 12,000 to 13,000; with cast-iron it is difficult to exceed 9,000 or 10,000.

The shoes A A have a surface $s = \rho_1$ B F (fig. 8); it is not advisable to make F too great, as there would be a tendency to leakage of flux outside the winding, and therefore the ratio s/s should not exceed 6, which gives a field of about 2,000 gauss in the air-gap. It only remains to determine the dimensions of the magnets. The best magnets never exceed, at the neutral section and on magnetic short-circuit, an induction of 7,000 gauss, and it is better to reckon only on 5,000, which, allowing for the inevitable leakages, gives a useful induction of about 3,000; hence the magnets must have a section of almost four times that of the armature core. The length of the magnets may vary widely, according to considerations of construction, available space and weight; as the magnetic circuit is almost closed, there is nothing to gain by making the magnets long so as to avoid demagnetisation. Generally the length is five or six times the diameter of the armature.

Ignition magnetos being intended to generate a current which is broken at the most favourable moment—that is, when the axis of the armature is perpendicular to the lines of force of the magnet—the magnetic field due to the armature current cannot at that moment have any effect upon the magnet. But this is not always the case in practice, and it happens sometimes that the rupture takes place after the position of zero flux is passed, and in that event the current tends to demagnetise the magnets. Moreover, the current does not always stop suddenly at the moment of break, but often sets up an arc, which prolongs its duration, and this delayed current may have a detrimental effect. As the magnetomotive forces of the magnets and armature may be of the same order of magnitude, this point is worthy of attention; the best course seems to be to take care that rupture does not occur with too much delay after passing the line of zero flux.

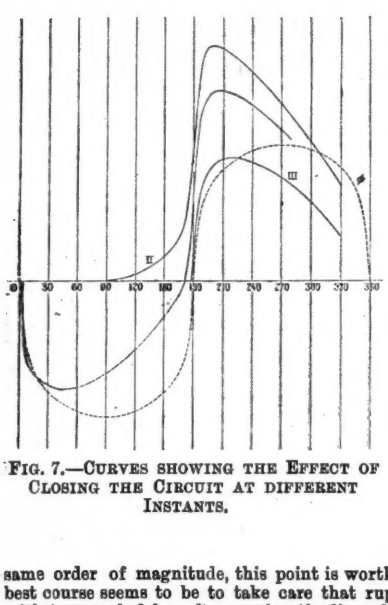


Fig. 7.—Curves showing the Effect of Closing the Circuit at different Instants.

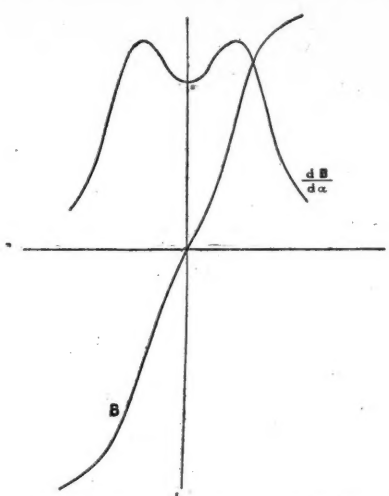


Fig. 9.—Curves of Flux and dB/da with Armature Shoes narrower than Gap between Pole Tips.

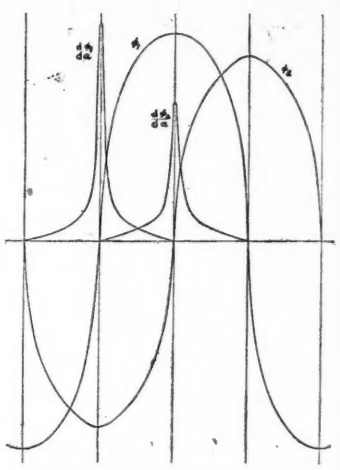


Fig. 10.—Effect of width of Air-gap on Curves $d\phi/da$.

As the ignition magneto is intended for intermittent operation, the energy available at each rupture is the important quantity, apart from the true power, which is another function of the speed. Neglecting the current, often negligible, which follows the spark, at each rupture we have at our disposal the energy $W = \frac{1}{2} L i_r^2$. We can determine W for the two limiting cases—zero and infinite speed—but first it is necessary to express the inductance L and the resistance R of the circuit in terms of the dimensions of the winding. As a first approximation let us assume that the inductance is proportional to a constant term B, to the section S, and to the square of the number of turns, or $L = B S n^2$. For similar armatures we can write $R = an^2$.

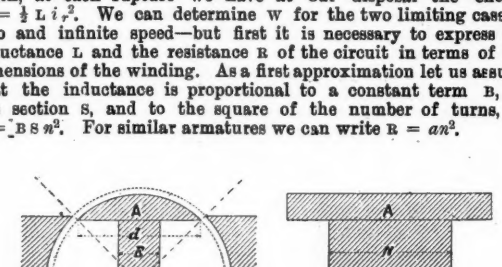


Fig. 8.—Section of H Armature and Pole-pieces.

Substituting for dB/da in the equation for i_r we have $i_r = 2\pi m n S Z B_{max}/R$, whence $W = 2\pi^2 B m^2 Z^2 S^2 B^2_{max}/a^2$, or, replacing the induction by the total useful flux, $\phi_{max.} = S B_{max.}$, we get $W = 2\pi^2 B m^2 Z^2 S \phi^2_{max.}/a^2$. It might seem advantageous, for a given flux, to lower the induction by increasing S; but the factor a is also a function of S, since the mean length of a turn increases with the section, and it is preferable to keep to an induction near 12,000.

Let us take now the higher limit of current strength; we have $W = S/2B \times (B_r - B_c)^2$, or at the maximum, when $B_r = -B_c$, $W = 2S/B \times B^2_{max}$.

The two limiting expressions have this feature in common—that the number of turns does not enter into them; the energy is derived almost entirely from the magnetic circuit, and it is only by increasing S that one can increase the available energy, since other considerations fix the maximum induction. We speak here only of the section S, but the interesting factor is really the volume of iron, which is implicitly given by the value of S, since we know that there is a practical relation between S and s, the polar surface, which is itself a function of the diameter of the armature.

As to the energy necessary for igniting the gaseous mixture, opinions are divided, but the expressions given above, applied to magnetos in good running order, give limiting values of practical interest. As a preliminary step we can include the values utilised in practice between the two following examples: For motor-cycles small magnetos are made, which weigh less than 2·5 kg., and give at starting a sufficiently powerful spark when the speed reaches about one revolution per second. The energy per spark, obtained from the above formula, is then of the order W = 0·007 joule. On the other hand, the type of magneto most generally used on cars with four-cylinder engines, running at the maximum speed, gives W = 1·2 joules. The first value would clearly be insufficient to ensure the regular running of the engine; there would be numerous misfires; but the second is certainly too high. One can safely say that with an expenditure of energy of one joule per spark the ignition is always perfectly ensured, and if misfires occur, the cause must be sought outside the magneto.

The foregoing calculation applies only to the energy available at the moment of rupture, and can be regarded as giving the maximum energy in magnetos with separate transformers; but in magnetos with direct sparks, as well as in low-pressure magnetos, in which the electrodes of the plug or of the ignition lever remain in connection with the magneto, it may happen that after the break-spark the current may be maintained by the electromotive force (much weaker, but not negligible) generated simply by rotation of the armature, and this would partly explain the fact, often observed, but without actual proofs, that magnetos with direct sparks are more effective, for equal power, than those with separate transformers.

The power necessary to drive the magneto includes the useful power given by the product of W with the number of sparks per second, together with all the electrical and mechanical losses. Few tests have been made on this question, but it is probable that the useful energy represents only a small fraction of the total energy expended, and that the efficiency is small.

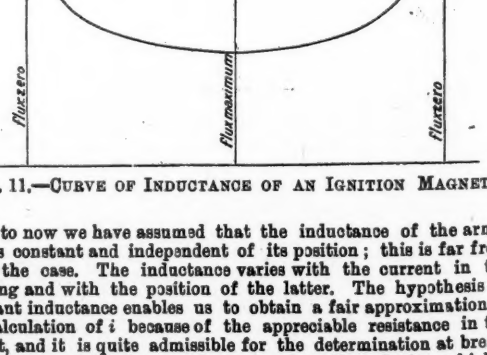


Fig. 11.—Curve of Inductance of an Ignition Magneto.

Up to now we have assumed that the inductance of the armature is constant and independent of its position; this is far from being the case. The inductance varies with the current in the winding and with the position of the latter. The hypothesis of constant inductance enables us to obtain a fair approximation in the calculation of i because of the appreciable resistance in the circuit, and it is quite admissible for the determination at break, for then everything happens in a very short time, during which L cannot vary appreciably. As a first approximation we give in fig. 11 a curve derived from a magneto for different positions of the armature, and taken with alternating current of constant strength. It will be seen that the inductance is a maximum wh the core of the armature is perpendicular to the axis of the p le-pieces, that is, when the magnetic flux sent through the cor e by

the magnet is zero. As the result of numerous tests, we may say that the inductance rises by 100 per cent. as the flux from the magnet passes from the maximum to zero, and one may take, for actual magnetos, the coefficient B as being equal to 150×10^{-9} for $B = 0$ and 75×10^{-9} for B maximum, the value of L being calculated in henries.

When the core of the armature is vertical, with the edges of the shoes facing the edges of the pole-pieces, as in fig. 8, a strong attraction is set up, and it is often difficult to pass this point.

The force thus exerted is proportional to the square of the flux and in inverse ratio to the section through which it passes, and the tangential component of this force, with which only we are concerned, is considerable; if the phenomenon were not in reality due to the *difference* between the opposed forces on the two edges of the shoes, it would be practically impossible to drive the magneto. For actual machines, calculation shows that the tangential pull is of the order of 40 kg. on each edge! Nevertheless, if the magneto were perfectly symmetrical, and if the ratio of flux to section of path were constant, the two attractions would balance one another, and one would not feel the passage of the shoes between the poles. In practice, the effort of passage is fairly considerable, and often very annoying, for it induces mechanical reactions which are very detrimental to the magneto.

One of the principal causes of this defect is certainly the bad shape of the shoes and poles; if the flux curve is like that shown in fig. 9, it will be seen that the maximum tangential force occurs before the passage through $\phi = 0$, that is, at a point where one of the edges of each shoe is more engaged with the pole-piece than the other; the opposed forces are then very different, and the total couple is considerable. These remarks are intended merely to indicate the direction for research to take; improvements can only be made by successive alterations of the outlines.

Starting from this point, the magneto acts as an inductance traversed by a current in the low-pressure type, and as the primary of an induction coil in that with direct sparks, and we enter a well-known field.

TRADE CONDITIONS AFTER THE WAR.

By C. F. Mottram.

It is difficult to estimate the effect of the present war on trade during the years immediately following its conclusion. The prevailing opinion seems to be that the huge expenditure of the nations involved will leave them, more or less, in a state of financial, as well as physical, exhaustion, and that there will be a serious shortage of capital. Assuming, of course, that the Entente Powers are finally victorious, what will be the effect of the war on the industries of this country? Will trade become stagnant for a time, or will the period of recovery here be more than counter-balanced by the capture of a large portion of the German foreign trade? Here lies a great opportunity for the British manufacturer. The crippling of our most serious European competitor should open up new markets for British goods giving the manufacturing centres opportunities for more oversea trade, which should compensate them for losses sustained during the present crisis. Immediate preparations must, however, as far as war conditions will allow, be made to capture this trade. We must be first in the field, and not leave everything until peace is proclaimed, when the Germans, aided by their Government, will endeavour to dump their goods anywhere abroad.

Of the large industries, the electrical can, perhaps, look forward with the greatest amount of optimism. In the past it has suffered much in this country from the keen competition of the German manufacturers, whose capacity for organisation has enabled them to spread their influence throughout all parts, greatly to the detriment of the home industry. They should not be allowed to resume this position after the war. A determined effort should be made by our manufacturers to take advantage of the wave of national feeling to obtain possession of and retain the home market, and to prevent the German resuming trade in this country on the terms he has hitherto enjoyed. There is no reason why every kind of electrical apparatus, from the largest generating set to the smallest lamp or switch, should not be easily procurable of British manufacture. Customers who in the past have purchased German plant on account of its so-called cheapness, and since the commencement of hostilities have found a difficulty in getting repairs and replacements, will no doubt appreciate the false economy of dealing with Continental firms. A strong effort should also be made to increase the present export figures of the electrical industry by taking advantage of the feeling now existing in many neutral nations against the German nation.

Electricity possesses so many advantages that it should rapidly forge ahead in the future. No other form of power is so readily adaptable to the various processes of manufacture. It takes up less floor space, which in some premises is a very important factor; it reduces transmission losses to a minimum, increases output, and also reduces labour, attendance and maintenance charges. Again, and this is a point which will no doubt be emphasised, when the energy is taken from the public supply mains, electrical plant is installed with less capital expenditure than any other form of power. There is a wide field, also, now for the use of electric vehicles which British enterprise should not leave our American cousins to exploit; we should claim our fair share of the business. If more attention is paid to the needs and requirements of the various customers, there will also be a more rapid development in the use of electrical cooking and heating apparatus; whilst for lighting, whether in the factory, shop, or residence, the many superiorities of electricity are now too well known to need recapitulation here. So far from being considered a luxury, it is now realised to be the most economical and scientific form of illumination.

A great deal of the success of industrial development naturally depends upon the organisation of the sales department, and, although economies may be effected here by manufacturers, one result of the war will probably be to increase the efficiency and importance of this section. Advertising should also receive greater consideration than in the past. Many British manufacturers have suffered much from the lack of attention to this very important subject. Literature, which only too soon finds its way into the waste-paper basket, is worse than useless. Apart from the choice of matter, which must meet the needs and suit the requirements of the various classes of customers, and also the national characteristics of different nations, greater attention must be given to the choice of colour, illustrations, diagrams, balance, selection of type, and general lay-out of all kinds of pamphlets, leaflets, etc., if the success which is so desired is to be attained.

In conclusion, if British manufacturers prepare for a determined effort to take advantage of public feeling, not only here, but also in neutral countries, to oust the German competitor, there is no reason why British trade, and more particularly the electrical, should suffer any temporary depression. It should even go ahead with a greater impetus, and thus help the nation to recover from the present disastrous but unavoidable conflict.

TRADE STATISTICS OF JAPAN, 1914.

The following statement, showing the imports into and the exports from Japan of electrical and similar goods during the year 1914, is taken from the recently-issued official trade statistics; the figures for 1913 are given for purposes of comparison, and notes of any increases or decreases are added:—

	1913. Yen.	1914. Yen.	Inc. or dec. Yen.
Galvanised iron wire.—			
From Great Britain ...	233,000	262,000	+ 29,000
,, Germany	2,043,000	1,486,000	− 557,000
,, Belgium	122,000	66,000	− 56,000
,, Austria	—	8,000	+ 8,000
,, United States ...	41,000	304,000	+ 263,000
,, Other countries ...	8,000	2,000	− 6,000
Total	2,447,000	2,128,000	− 319,000
Rails.—			
From Great Britain ...	555,000	72,000	− 483,000
,, Germany	1,197,000	643,000	− 554,000
,, Belgium	211,000	46,000	− 165,000
,, United States ...	1,922,000	1,115,000	− 807,000
,, Other countries ...	201,000	3,000	− 198,000
Total	4,086,000	1,879,000	− 2,207,000
Posts and materials for electric lines.—			
From Great Britain ...	6,000	2,000	− 4,000
,, Germany	15,000	24,000	+ 9,000
,, United States ...	284,000	580,000	+ 296,000
,, Other countries ...	1,000	6,000	+ 5,000
Total	306,000	612,000	+ 306,000
Copper (pipes and tubes).—			
From Great Britain ...	251,000	105,000	− 146,000
,, Germany	22,000	31,000	+ 9,000
,, Other countries ...	14,000	16,000	+ 2,000
Total	287,000	152,000	− 135,000
Insulated electric wire.—			
From Great Britain ...	491,000	160,000	− 331,000
,, France	2,000	—	− 2,000
,, Germany	1,419,000	235,000	− 1,184,000
,, United States ...	96,000	48,000	− 48,000
,, Other countries ...	3,000	1,000	− 2,000
Total	2,011,000	444,000	− 1,567,000
Steam turbines.—			
From Great Britain ...	20,000	22,000	+ 2,000
,, Germany	27,000	139,000	+ 112,000
,, United States ...	16,000	2,000	− 14,000
Total	63,000	163,000	+ 100,000

	1913. Yen.	1914. Yen.	Inc. or dec. Yen.
Submarine cable.—			
From Great Britain ...	51,000	926,000	+ 875,000
Cranes.—			
From Great Britain ...	426,000	150,000	− 276,000
,, Germany	473,000	124,000	− 349,000
,, United States ...	173,000	35,000	− 138,000
,, Sweden	7,000	24,000	+ 17,000
Total	1,079,000	333,000	− 746,000
Pumps.—			
From Great Britain ...	612,000	209,000	− 403,000
,, Germany	164,000	240,000	+ 76,000
,, United States ...	272,000	182,000	− 90,000
,, Other countries ...	33,000	34,000	+ 1,000
Total	1,081,000	665,000	− 416,000
Gas engines, petroleum engines and hot air engines.—			
From Great Britain ...	577,000	114,000	− 463,000
,, Germany	359,000	118,000	− 241,000
,, Belgium	7,000	—	− 7,000
,, Sweden	97,000	31,000	− 66,000
,, United States ...	80,000	88,000	+ 8,000
,, France	23,000	2,000	− 21,000
,, Italy	14,000	2,000	− 12,000
,, Switzerland ...	59,000	—	− 59,000
,, Other countries ...	—	11,000	+ 11,000
Total	1,216,000	366,000	− 850,000
Steam engines.—			
From Great Britain ...	219,000	244,000	+ 25,000
,, Germany	223,000	181,000	− 42,000
,, United States ...	27,000	17,000	− 10,000
,, Belgium	94,000	10,000	− 84,000
,, Other countries ...	6,000	1,000	− 5,000
Total	569,000	453,000	− 116,000
Steam boilers.—			
From Great Britain ...	660,000	654,000	− 6,000
,, Germany	150,000	192,000	+ 42,000
,, United States ...	77,000	13,000	− 64,000
,, Belgium	89,000	2,000	− 87,000
Total	976,000	861,000	− 115,000
Dynamos, electric motors, etc.—			
From Great Britain ...	1,035,000	667,000	− 368,000
,, Germany	1,460,000	808,000	− 652,000
,, Switzerland	49,000	56,000	+ 7,000
,, United States ...	1,706,000	1,211,000	− 495,000
,, Sweden	18,000	91,000	+ 73,000
,, Other countries ...	22,000	10,000	− 12,000
Total	4,290,000	2,843,000	− 1,447,000
Water turbines and Pelton wheels.—			
From Great Britain ...	37,000	9,000	− 28,000
,, Germany	613,000	206,000	− 407,000
,, France	4,000	—	− 4,000
,, Switzerland	—	14,000	+ 14,000
,, Sweden	21,000	81,000	+ 60,000
,, Belgium	14,000	7,000	− 7,000
,, Denmark	26,000	—	− 26,000
,, Italy	13,000	5,000	− 8,000
,, Other countries ...	1,000	—	− 1,000
Total	729,000	322,000	− 407,000
Incandescent electric lamps.—			
From Great Britain ...	6,000	4,000	− 2,000
,, Germany	238,000	379,000	+ 141,000
,, United States ...	2,000	8,000	+ 6,000
,, Other countries ...	38,000	—	− 38,000
Total	284,000	391,000	+ 107,000
Wattmeters.—			
From Great Britain ...	30,000	29,000	− 1,000
,, Germany	149,000	117,000	− 32,000
,, United States ...	80,000	36,000	− 44,000
,, Other countries ...	2,000	11,000	+ 9,000
Total	261,000	193,000	− 68,000
India-rubber and gutta-percha, crude.—			
From British India ...	479,000	447,000	− 32,000
,, Straits Settlements ..	1,771,000	1,357,000	− 414,000
,, Dutch India	18,000	3,000	− 15,000
,, Great Britain ...	818,000	319,000	− 499,000
,, Germany	21,000	2,000	− 19,000
,, United States ...	200,000	16,000	− 184,000
,, Other countries ...	145,000	3,000	− 142,000
Total	3,452,000	2,147,000	− 1,305,000

The exports of electric machines and parts thereof from Japan in the years 1913 and 1914 were as follows:—

	1913. Yen.	1914. Yen.	Inc. or dec. Yen.
To China	249,000	268,000	+ 19,000
,, Kwantung Province ...	155,000	130,000	− 25,000
,, Philippine Islands ...	2,000	2,000	—
,, Siam	1,000	1,000	—
,, Australia	10,000	15,000	+ 5,000
,, Hong-Kong	13,000	13,000	—
,, British India	19,000	9,000	− 10,000
,, Straits Settlements ...	2,000	4,000	+ 2,000
,, Germany	1,000	6,000	+ 5,000
,, Other countries ...	18,000	4,000	− 14,000
Total	470,000	452,000	− 18,000

Yen = 2s. 0½d.

NEW PATENTS APPLIED FOR, 1915.

(NOT YET PUBLISHED).

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

14,026. "Electro-magnetically-operated clutches, particularly applicable to reversing-gear for reciprocating machines." Lancashire Dynamo & Motor Co., Ltd., and W. Hargreaves. October 4th.

14,043. "Vibratory electric bath blanket." H. D. Parker. October 4th. (Complete.)

14,120. "Dynamo-electric machines." H. Lucas & C. L. Breeden. October 5th.

14,121. "Means for connecting electrical conduits." F. W. Uren. October 5th.

14,145. "Electric indicating and lighting systems." A. Blackmore. October 6th.

14,160. "Dynamo-electric machines." A. H. Neuland. October 6th. (Complete.)

14,164. "Electrical resistances." J. Collinson. October 6th.

14,214. "Electrical measuring instruments." C. E. Foster. October 7th.

14,216. "Dynamo-electric machines of the commutator type." M. Walker. October 7th.

14,232. "Portable telephone and telegraph instruments." International Electric Co., Ltd., & R. G. le Noir. October 7th.

14,233. "Telephones." International Electric Co., Ltd., & R. G. le Noir. October 7th.

14,273. "Process for the electrolysis and treatment of sulphate liquors." E. J. Hunt & W. T. Gidden. October 8th. (Addition to 11,634/13.) (Complete.)

14,302. "Electric instrument for determining and indicating the altitude of an aeroplane or the like when descending to earth." A. Johnson & A. Kingman. October 9th.

14,310. "Process for the production of cuprous oxide electrolytically." B Hunt. October 9th.

14,311. "System for the generation of electric currents." C. F. Benitez. October 9th. (Addition to 17,811/14.)

14,328. "Electric signalling systems." H. R. Rivers-Moore. October 9th. (Addition to 1,649/10.)

PUBLISHED SPECIFICATIONS.

1914.

16,935. Combined Dynamo and Accumulator Electric Systems. Soc. Anon des Etablissements L. Bleriot. July 16th. (September 24th, 1913.)

16,936. Control Systems for Electric Installations. Soc. Anon. des Etablissements L. Bleriot. July 16th. (September 24th, 1913.)

20,130. Rheostats. Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co., U.S.A.). September 24th.

20,728. Electrical Heating Elements. G. H. Collins & H. F. Collins. October 8th.

21,680. Telegraph, Submarine Sound Signalling, or similar systems. W. H. Shephard & A. E. McKechnie. October 28th.

21,881. Machine for Winding Electro-magnetic Coils. C. H. Thordarson. November 2nd.

22,647. Methods of using Electric Condensers for Transformation of Energy. J. E. Taylor. November 18th.

23,189. Apparatus for Charging Electric Accumulators. H. F. Joel, sen. November 27th.

23,211. Electric Bells or Gongs. H. F. Macdonald. November 28th. (Addition to 7,638/13.)

24,049. Means for the Electrical Heating of Steering Wheels. R. S. Smith. December 14th.

24,475. Electrical Vibratory Contact Makers and Breakers. J. Gardner. December 22nd.

24,637. Control Devices for Electric Clock Systems. G. C. Hatton. December 24th.

1915.

367. Electrical Switches. A. P. Lundberg, G. C. Lundberg, P. A. Lundberg, & G. Pegg. January 9th.

1,119. Electrical Alarm Apparatus for Mines and like places. J. P. O'Donnell (G. D. Hodges & D. Smith). January 23rd.

2,934. Pocket Electric Flashlights. W. J. Mellersh-Jackson (S. I. Posen) February 23rd. (Addition to 18,809/14.)

7,270. Electrical Measuring Instruments operating on the Ferraris or Induction Principle. E. Fawssett. May 14th.

9,336. Devices for Establishing Electric Connection between Conductors. H. G. Wood. June 25th.

11,480. Band Resistance for use with Electric Pedal Switches. Robert Bosch (firm of). August 9th. (July 29th, 1914. Divided application on 2,236/15, February 11th.)